

NORTH CAROLINA OFFICE OF THE STATE CONTROLLER
Single Audit Reporting Package
Schedule of Expenditures of Federal Awards
For the Fiscal Year Ended June 30, 2017

Agency No. 16
 Agency Name Department of Environmental Quality

CFDA Programs :

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(10)
Federal Agency Number	Federal CFDA Number	Additional Award Identifying Information	Direct/ Indirect (D / I)	Program Cluster Enter "NC" if no assigned cluster	Enter Whole Dollars Only		CFDA (Program) Title as listed in the Catalog of Federal Domestic Assistance https://www.cfda.gov/
					Total Federal Awards Expended	Amount Provided to Subrecipients	
66	66.001	A00406015	D	RD	1,848,130		Air Pollution Control Program Support
66	66.034		D	NC			Surveys, Studies, Research, Investigations, Demonstrations, and Special Purpose Activities Relating to the Clean Air Act
66	66.040	DS00D23114	D	NC	69,758		State Clean Diesel Grant Program
66	66.202	XP-97455902	D	NC	532,047		Congressionally Mandated Projects
66	66.419	I95471716	D	RD	6,639,328		Water Pollution Control State, Interstate, and Tribal Program Support
66	66.432	F00429617	D	NC	2,932,217		State Public Water System Supervision
66	66.433	G00435617	D	NC	105,293		State Underground Water Source Protection
66	66.454	C60047715-17	D	NC	314,391		Water Quality Management Planning
66	66.456	CE00D20614	D	NC	528,862		National Estuary Program
66	66.458	CS37000116	D	CWSR	24,112,999	23,148,480	Capitalization Grants for Clean Water State Revolving Funds
66	66.460	C999465713-16	D	NC	3,638,060		Nonpoint Source Implementation Grants
66	66.461	CD00D5115-316	D	RD	44,617		Regional Wetland Program Development Grants
66	66.462	CD00D40215	D	NC	63,265		National Wetland Program Development Grants and Five-Star Restoration Training Grant
66	66.468	FS98433816	D	DWSR	24,019,376	17,757,726	Capitalization Grants for Drinking Water State Revolving Funds
66	66.472	CU00D16413	D	NC	252,235		Beach Monitoring and Notification Program Implementation Grants
66	66.708	NP00D38815	D	RD	83,501		Pollution Prevention Grants Program
66	66.801	D00406917	D	NC	2,028,159		Hazardous Waste Management State Program Support

66	66.802	V00D37215,315	D	NC	1,268,011	Superfund State, Political Subdivision, and Indian Tribe Site-Specific Cooperative Agreements
66	66.804	L95414316	D	NC	855,933	Underground Storage Tank Prevention, Detection and Compliance Program
66	66.805	LS00D45016	D	NC	2,009,857	Leaking Underground Storage Tank Trust Fund Corrective Action Program
66	66.809	V00D37115	D	RD	152,422	Superfund State and Indian Tribe Core Program Cooperative Agreements
					71,498,461	40,906,206
					Total	Total

Note: Federal Agency 66 is USEPA.



P O L I C Y

Section: Administration

Subject: Environmental Equity Initiative

Approved By: DENR Secretary

Eff. Date: Oct 19, 2000

Revised:

Page 1 of 2

Environmental Equity Policy

The Environmental Equity Initiative supports the NC DENR's mission of protecting our state's precious human and natural resources. We do this by ensuring clean air, clean water, and proper and safe disposal of pollutants in a manner consistent with sustainable development. Our key focus is to address issues as they arise, establish lines of communication with industries and affected communities, and bridge the gap of misunderstanding that often becomes a significant barrier in problem resolution. By fostering meaningful participation and greater understanding, we reduce risk, share responsibility and enjoy mutual benefits. By building consensus with our two primary customers (community and industry) and assuring that we protect our silent customer (nature), we allow all parties to become true stakeholders in the environmental regulatory process.

Low income and minority communities often believe that they are burdened with a disproportionate share of our state's environmental risks. This belief in some instances, may be well founded. However, these beliefs can also create a hostile environment in which good-faith efforts to resolve disputes, address concerns, and seek consensus solutions are nearly certain to fail. The NC DENR's Environmental Equity Initiative attempts to create opportunities for successful and productive communication between the agency, local community, and neighboring industries. Providing all citizens the opportunity for meaningful input into decision-making processes is critical to effective government.

DENR Goals for Environmental Equity:

- To ensure that agency programs substantially affecting human health or the environment operate without discrimination,

- To provide information for citizens and neighborhood groups to allow meaningful participation in regulatory processes,
- To respond in a meaningful manner to allegations of environmental injustice,
- To provide a link for communication and information between the community, industries and the government,
- To increase awareness of environmental conditions in minority and low-income communities.

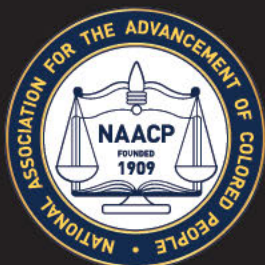
To Meet The Goals, DENR Will:

- Inform potentially affected and protected communities about the Environmental Equity Initiative which seeks first to fully understand environmental issues as raised by the community, staff, industry, or other interested parties, and then attempts to address them in an environmentally sensitive manner that is consistent with sustainable economic development.
- Address environmental equity issues in permitting decisions for projects potentially having a disparate impact on communities protected by Title VI of the Civil Rights Act of 1964,
- Promote greater use and analysis of demographic information to identify communities that may be disproportionately impacted by sources of pollution,
- Use demographic information to determine whether there is: 1) a need for greater outreach to community in order to encourage more meaningful participation, or 2) special health risks based on the nature of the population,
- Develop guidelines for assessing the cumulative effects of permitted facilities.
- Provide opportunities for interested parties to raise concerns on Environmental Equity in DENR's decisions,
- Develop a process for intervention or mediation specific for each instance with a focus on mutually acceptable solutions,
- Resolve environmental equity complaints, consistent with the protection afforded by Title VI of the Civil Rights Act of 1964,
- Develop a full record of environmental equity issues.

NOVEMBER 2017

Fumes Across the Fence-Line

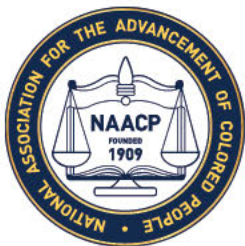
The Health Impacts of Air Pollution from Oil & Gas Facilities on African American Communities



CLEANAIR
TASK FORCE

Fumes Across the Fence-Line:

The Health Impacts of Air Pollution
from Oil & Gas Facilities on African
American Communities



November 2017

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Executive Summary

The oil and gas industry dumps 9 million tons of methane and toxic pollutants like benzene into our air each year. Methane is a greenhouse gas 87 times more potent than carbon dioxide at driving climate change and the oil and gas industry is now the largest source of methane pollution in the U.S. But methane is just one harmful air pollutant from the oil and gas industry. This paper sheds light on the health impacts of air pollutants from oil and gas facilities that specifically threaten the health of African American communities living near oil and gas facilities and in areas far from oil and gas production.

The life-threatening burdens placed on communities of color near oil and gas facilities are the result of systemic oppression perpetuated by the traditional energy industry, which exposes communities to health, economic, and social hazards. Communities impacted by oil and gas facility operations remain affected due to energy companies' heavy polluting, low wages for dangerous work, and government lobbying against local interests. The nature of the vulnerability of African American and other person of color fence-line communities is intersectional—subject to connected systems of discrimination based on social categorizations such as race, gender, class, etc.

Health impacts from the natural gas supply chain (natural gas facilities as well as oil production facilities with associated gas) were quantified in two reports published by Clean Air Task Force (CATF). As demonstrated in the CATF's *Fossil Fumes* report, many of these toxic pollutants are linked to increased risk of cancer and respiratory disorders in dozens of counties that exceed U.S. EPA's level of concern. These pollutants from the natural gas supply chain also contribute to the



The life-threatening burdens placed on communities of color near oil and gas facilities are the result of systemic oppression perpetuated by the traditional energy industry, which exposes communities to health, economic, and social hazards.

ozone smog pollution that blankets the U.S. in the warmer months. The 2016 *Gasping for Breath* report, published by CATF, found that ozone smog from natural gas industry pollution is associated with 750,000 summertime asthma attacks in children and 500,000 missed school days. Among adults, this pollution results in 2,000 asthma related emergency room visits and 600 hospital admissions and 1.5 million reduced activity days. (Chapter 2)

This paper also shows the health impacts from petroleum refinery pollution. While we do



Air pollution is emitted from dozens of types of equipment and processes throughout the oil and gas sector. Many proven, low-cost technologies and practices are available to reduce these emissions, while also reducing emissions of methane, the main constituent of natural gas.

not quantify health impacts from oil refineries, as we did for impacts from natural gas facilities, we include case studies and stories from community members that have been impacted by pollution from these facilities. In this chapter, we focus solely on petroleum refineries, not the entire petroleum supply chain. (Chapter 3)

Many African American communities face serious health risks caused by air pollution. Higher poverty levels increase these health threats from air pollution translating into a bigger health burden on African American communities. And, companies often site high polluting facilities in or near communities of color, furthering the unequal distribution of health impacts. This paper for the first time quantifies the elevated health risk that millions of African Americans face due to pollution from oil and gas facilities. Specifically, the paper finds that:

- More than 1 million African Americans live within a half mile of existing natural gas facilities and the number is growing every year.
- As a result, many African American communities face an elevated risk of cancer due to air toxics emissions from natural gas development: Over 1 million African Americans live in counties that face a cancer risk above EPA's level of concern from toxics emitted by natural gas facilities.
- The air in many African American communities violates air quality standards for ozone smog. Rates of asthma are relatively high in African American communities. And, as a result of ozone increases due to natural gas emissions during the summer ozone season, African American children are burdened by 138,000 asthma attacks and 101,000 lost school days each year.
- More than 6.7 million African Americans live in the 91 counties with oil refineries.

The impacts described in this paper are just one layer of the many public health issues that these communities face. For example, this analysis only accounts for the risks associated with air pollution from oil and gas facilities—water and soil contamination may also harm communities living near oil and gas facilities. We also only included health impacts directly linked to oil and gas facilities—oil and gas development may also bring increased truck traffic, oil trains, and changes in land use, which can have significant public health impacts. In addition, many African American communities are located near other major sources of pollution, like power plants, chemical plants, hazardous waste facilities, and others. These communities already face high levels of pollution from various sources, and the added health threats from oil and gas development exacerbate their problems.

Air pollution is emitted from dozens of types of equipment and processes throughout the oil and gas sector, such as wells, completion equipment, storage tanks, compressors, and valves. Many proven, low-cost technologies and practices are available to reduce these emissions, while also reducing emissions of methane, the main constituent of natural gas. Thus, policies that

reduce pollution from the oil and gas industry can help protect the health of local communities while addressing global climate change. In the Waste Not report, Clean Air Task Force (CATF), the Natural Resources Defense Council (NRDC), and the Sierra Club called for EPA regulations to cut methane emissions from the oil and gas industry by half. These methane standards would also significantly cut toxic and ozone-causing air pollution, which could have important benefits for air quality and public health in and downwind of oil and gas producing areas. In addition, stringent standards specifically for toxic and ozone-causing pollutants emitted throughout the oil and gas supply chain are needed to ensure compliance with the Clean Air Act and protect public health.

Defending the safeguards finalized during the Obama administration and pushing for additional protections against pollution from the oil and gas industry will help improve the health of many African American communities while addressing global climate change. In June 2016, the EPA finalized strong methane standards covering new and modified oil and gas facilities. Although cutting methane from new oil and gas facilities is a step in the right direction, more important is cutting pollution from the nearly 1.3 million existing oil and gas facilities. These standards will reduce the risk from the air toxics and ozone smog-forming pollutants from this industry, but without a comprehensive standard, the vast majority, at least 75 percent, of all of the wells and oil and gas infrastructure in use today, will remain virtually unregulated and can continue to pollute without limit. Existing facilities spewed over 8 million metric tons of methane in 2015—equivalent in near-term warming potential to the greenhouse gas emissions from 200+ coal-fired power plants. To reduce the risk from air toxics and smog-forming pollution from this industry, EPA must require pollution reductions from all oil and gas facilities, and not roll back the protections that are already in place.

Environmental and energy justice issues are multilayered. Thus, the approach to tackling these issues must also be multilayered. People of color

and low-income communities are disproportionately affected by exposure to air pollution, and standards that protect communities from this pollution are critical. In addition, these communities have a lot to gain from the transition from the current fossil fuel energy economy to one based on equitable, affordable, and clean energy sources. African American and other fence-line communities, such as people who are low-income, can organize to fight the intentional polluting of their neighborhoods. The first step is to address the many ways fossil fuels taint our communities, including the air pollution from oil and gas development.



Equipment at a gas well.

Defending the safeguards finalized during the Obama administration and pushing for additional protections against pollution from the oil and gas industry will help improve the health of many African American communities while addressing global climate change.

CHAPTER 1

Environmental Pollution and the Health Impact in African American Communities

The racial disparities among communities impacted by environmental pollution in the United States are stark. African Americans are exposed to 38 percent more polluted air than Caucasian Americans, and they are 75 percent more likely to live in fence-line communities than the average American.¹ Fence-line communities are communities

that are next to a company, industrial, or service facility and are directly affected in some way by the facility's operation (e.g. noise, odor, traffic, and chemical emissions). Most fence-line communities in the United States are low-income individuals and communities of color who experience systemic oppression such as environmental racism.

It is not a coincidence that so many African Americans live near oil gas development. Historically, polluting facilities have often been sited in or near African American communities.

Many African Americans are exposed to high levels of pollution.

The air in many African American communities violates air quality standards intended to protect human health.

Over 1 million, or two percent of African Americans, live in areas where toxic air pollution from natural gas facilities is so high that the cancer risk due to this industry alone exceeds EPA's level of concern.² And, over 1 million African American individuals live within a half mile of an oil and gas facility—those within this half mile radius have

cause for concern about potential health impacts from oil and gas toxic air pollution.³ These figures only account for air pollution from wells and natural gas compressors and processors—the numbers would be much higher if pollution from oil refineries was factored.

It is not a coincidence that so many African Americans live near oil gas development. Historically, polluting facilities have often been sited in or near African American communities. Companies take advantage of communities that have low levels of political power.⁴ In these communities, companies may face lower transaction costs associated with getting needed permits, and they have more of an ability to influence local government in their favor.⁵

African Americans and other environmental justice communities face heavy burdens because of the millions of pounds of hazardous emissions released by the oil and gas industry each year. Many African American communities face serious health risks as a result of toxic pollution from industrial facilities that are often located blocks from their homes. These life-threatening burdens are the result of systemic oppression perpetuated by the traditional energy industry, which exposes communities to health, economic, and social hazards. Communities impacted by oil and gas facility operations remain affected due to energy companies' heavy polluting, low wages for dangerous work, and government lobbying against local interests.⁶ African American and other person of color living in fence-line communities experience connected systems of discrimination based on

social categorizations such as race, gender, class, disability, etc. These communities are impacted by the negative health impacts of oil and gas facility operations because of discrimination.

The impacts described in this paper are just one layer of the many public health issues that

African American and other communities of color face as a result of oil and gas operations. For example, this analysis only accounts for the risks associated with air pollution from oil and gas facilities—the exposure risks from water and soil contamination may also harm communities living near

CASE STUDY

Siting of natural gas infrastructure in environmental justice communities

The Atlantic Coast Pipeline (ACP), North Carolina, Virginia, and West Virginia

Set for completion in 2019, Duke Energy and Dominion Resources have begun steps to build a 600-mile transmission pipeline from West Virginia through eastern North Carolina. The Atlantic Coast Pipeline (ACP), being built to bring natural gas from hydraulic fracturing sites in West Virginia and Pennsylvania to power plants in North Carolina.¹⁰ This expansion of coastal infrastructure along the densely populated East Coast, will increase the likelihood of facilities being sited in heavily populated areas. Typically, areas with a high concentration of low-income and people of color, as well as other fence-line communities.

The North Carolinian coastline from the Outer Banks north to the Virginia line, is heavily populated by low-income, African American residents. The proposed route of the ACP directly impacts a number of African-American, and other vulnerable communities, in the state. In seven of the eight counties along the proposed route the African American population ranges from 24.3 to 58.4 percent, compared to the 21.3 percent at the state level. These counties also reflect income vulnerability, as seven of the eight counties have median household incomes below the statewide median of \$46,693. Seven of the eight counties along the proposed route have poverty levels higher than the state average (17.2 percent), ranging from 17.6 to 33.1 percent.¹¹ The expansion of the ACP and other natural gas infrastructure along the North Carolinian coast would have unavoidable adverse impacts on already vulnerable communities.

The pipeline is not the only piece of infrastructure to be established as a part of the project. As part of the plan for the Atlantic Coast Pipeline, Dominion intends to build a compressor station in Northampton County, North Carolina, a county that share's a border with Virginia. Northampton's African American population is 54.6 percent, and the median household income in \$31,453, nearly \$15,000 below the state average. Almost 32 percent of Northampton residents live in poverty, compared to 17.2 percent statewide.¹²

The overall cancer rate in Northampton County exceeds that for the state of North Carolina at 516.6 per 100,000 (the state average is 488.9 per 100,000 people). Lung and bronchial cancers, two forms of cancer caused by common air pollutant, are specifically elevated: 80.5 per 100,000 people compared to 70.1 per 100,000.¹³ Given the current state of vulnerable populations in the area of impact of the proposed pipeline, particularly in in North Hampton, a compressor station, pipeline, and other natural gas infrastructure, could exacerbate health problems from increased air pollution.

For more on the communities affected by the ACP project visit the [Southern Environmental Law Center, Path of the Pipeline](#).¹⁴

oil and gas facilities.⁷ We also only included health impacts directly associated with oil and gas facilities—oil and gas development may also entail increased truck traffic, oil trains, and changes in land use, which can have significant public health impacts.⁸ In addition, many African American communities are located near other major sources of pollution, like power plants, chemical plants, hazardous waste facilities, and others.⁹ These communities already face high levels of pollution from various sources, and the added health threats from oil and gas development exacerbate their problems.

This paper sheds light on the health impacts many African American communities face from oil and natural gas production, processing, and transmission facilities. It also underscores both the need to implement commonsense standards that reduce pollution from these facilities, and the need to transform the current energy economy

into one that is based on clean energy sources and the principles of energy democracy (local energy choice) and energy sovereignty (local control of energy systems). This new energy economy will need to address the overlapping systems of oppression that allow whole communities to be poisoned.

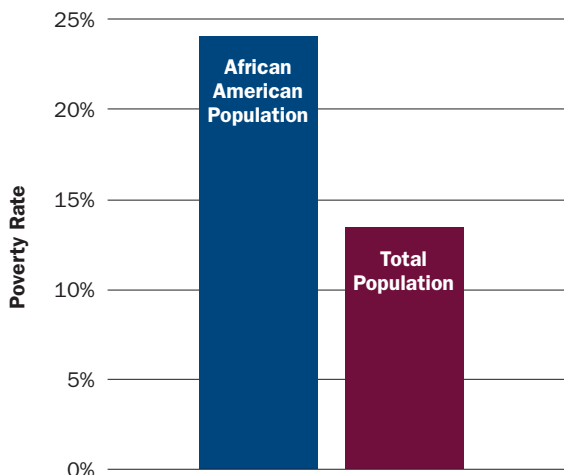
Asthma threatens the health of children in African American communities.

Approximately 13.4 percent of African American children have asthma (over 1.3 million children), compared to 7.3 percent for white children.¹⁵ The death rate for African American children with asthma is one per 1 million, while for white children it is one per 10 million.¹⁶

Many African Americans are particularly burdened with the health impacts from air pollution, due to high levels of poverty and relatively lower rates of health insurance.

Individuals living below the poverty level are particularly burdened by the effects of air pollution. In 2015, 24 percent of the African American population (including 32 percent of African American children) were living in poverty, compared to 14 percent for the overall US population (and 20 percent of US children).¹⁷ High poverty rates restrict housing options for African American families. African Americans are also somewhat less likely to have health insurance than the population as a whole. In 2015, 11.5 percent was the uninsured rate for African Americans under the age of 65, versus 10.8 percent for the population as a whole and 7.5 percent for the white population.¹⁸ The combination of higher poverty rates and lower prevalence of health insurance exacerbates the impact air pollution has on low-income African American families.

FIGURE 1
Poverty Rate



Source: U.S. Census Bureau, National Center for Health Statistics

“Common sense would suggest that a pipeline carrying a highly flammable substance and a massive polluting industrial facility should not be placed in any residential community, much less an environmental justice community.”

– Congressman Sanford D. Bishop, Jr. John Lewis, Hank Johnson Jr., and David Scott in a 2015 response to the Saber Trail Pipeline Project in Alabama, Southern Georgia, and Central Florida.¹⁹

COMMUNITY STORY

“My parents grew up on the Permian Basin where we have some of the largest frack fields and very old oil wells, as well. Thinking about the impacts of these chemicals and toxins that persist in the area, I realized that I never been out of this stuff. Even in the womb of my mother and her own sort of chemistry and biology that she grew up with having spent her whole life there.... The city of Houston did a study and identified 12 carcinogens and that research is available and some of the highest concentrations are in areas that I grew up in and spent majority of my childhood in. Some of the things that I experienced were frequent headaches, irritability, and nose bleeds, gastrointestinal problems, a lot of things that I said I can show and we have seen are the same symptoms are as a result from being exposed to some of these carcinogens.”

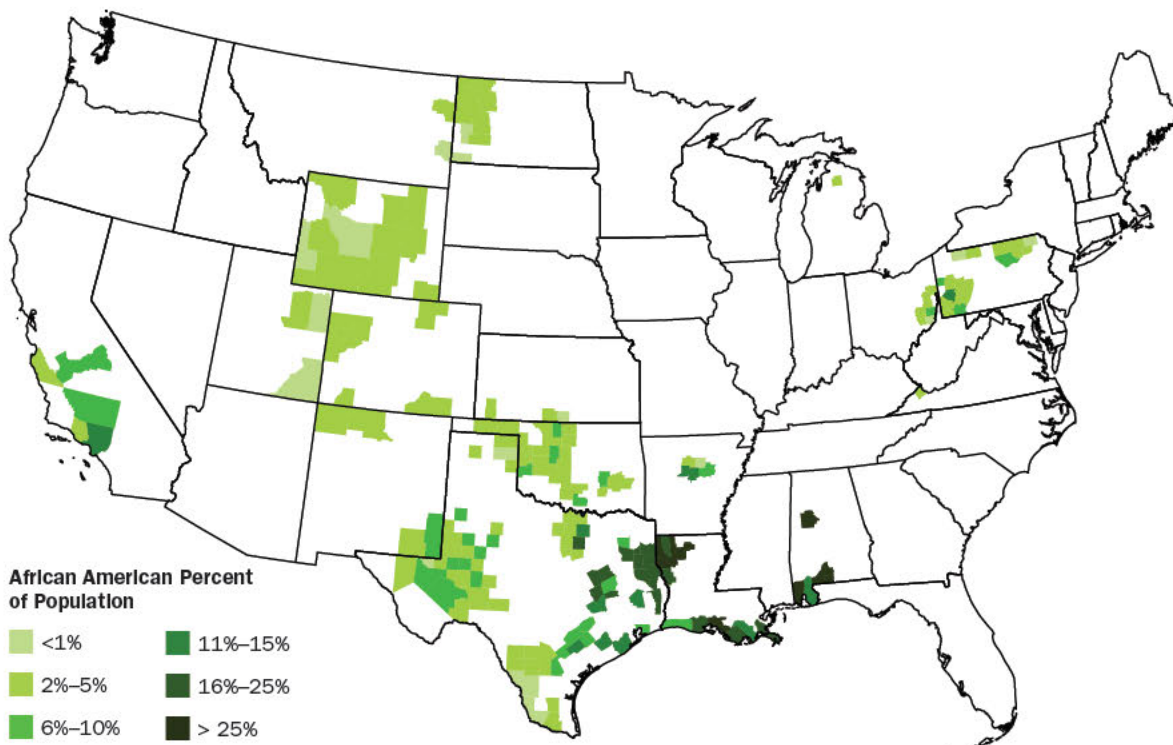
— Bryan Parras, Houston, TX

A large number of African Americans live in states with large numbers of polluting oil and gas facilities.

Many of the states with the highest amount of oil and gas development also have large African American populations. In three of the top ten oil and gas production states of 2015—Louisiana,

Texas, and Pennsylvania—African Americans made up more than 10 percent of the population. And, in two of the other top oil and gas states—North Dakota and Wyoming—the African American population has grown significantly since 2000, a time when oil and gas production in these states has also grown.²⁰

FIGURE 2
African American Percent of Population In 200 Counties with Highest Oil and Gas Production (2015)



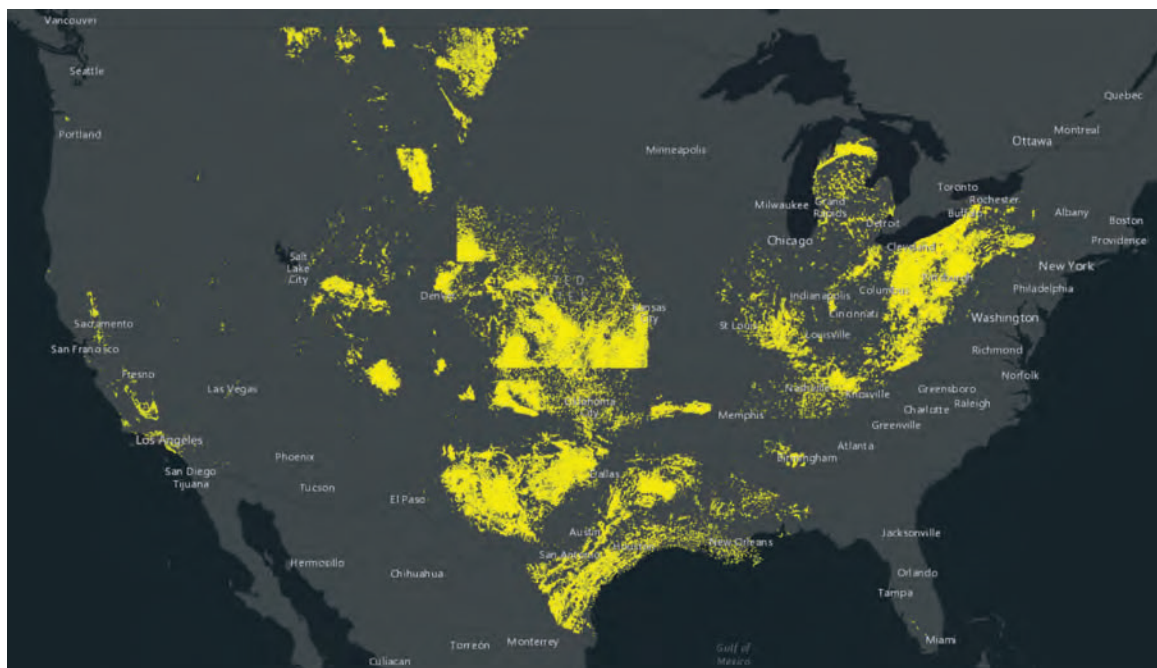
Source: U.S. Census Bureau, DI Desktop

Earthworks released the “Oil and Gas Threat Map,” an interactive map of the nearly 1.3 million active oil and gas wells, compressors and processors in the U.S.²¹ The map shows how many African Americans live within a half mile of oil and gas facilities, and it indicates that those within this radius have cause for concern about potential health impacts from oil and gas pollution. It is

not a declaration that those near oil and gas facilities will definitely have negative health impacts, and it also does not mean that people living further than a half mile are safe from health impacts. As we document later in this paper, there is ample evidence that the pollution from oil and gas operations impacts individuals and communities both close to and far from these facilities.

FIGURE 3

Threat Radius—The Area within a Half Mile of Active Oil and Gas Wells, Compressors, and Processing Plants



The oil and gas well data was downloaded directly from state government agencies, and it includes all active conventional and unconventional wells in 2016 and 2017. Gas compressor and processing plant data were primarily taken from a variety of state and federal databases. State and federal agencies do not monitor compressors and processing plants as closely as they do wells, so this data is not comprehensive in all states.

Source: <http://oilandgasthreatmap.com/threat-map>

COMMUNITY STORY

“Fortunately, no one was seriously injured as a result of the explosion, but nearby residents were concerned about what they might be exposed to as a result of the explosion [BP Amoco and Enterprise Products, LLC gas processing plant in Jackson County, MS]...Unlike oil and chemical plants, gas processing plants are not required to report the list and quantity of hazard pollutants they release to the Environmental Protection Agency’s Toxic Release Inventory (TRI) Program.”

— Steps Coalition, Biloxi, MS

More than 1 million African Americans nationally (2.4 percent of the total African American population) live within a half mile radius of oil and gas facilities (see Table 1).

- Ohio, Texas, and California have the most African Americans living within a half mile radius of oil and gas facilities.
- And, in Oklahoma, Ohio, and West Virginia, approximately one in five African Americans in the states live within the half mile radius of oil and gas facilities.

TABLE 1
Top 10 States by African American Population Living within a Half Mile Radius of Oil and Gas Facilities (2010 Census)

State	African American Population within a Half Mile Radius	Percent of African American Population in State within a Half Mile Radius
Texas	337,011	10%
Ohio	291,733	19%
California	103,713	4%
Louisiana	79,810	5%
Pennsylvania	79,352	5%
Oklahoma	73,303	22%
West Virginia	13,453	17%
Arkansas	10,477	2%
Mississippi	10,448	1%
Illinois	10,227	1%
TOTAL	1,052,680	2%

Source: <http://oilandgasthreatmap.com>



Equipment at a gas well.

© CATF

BOX 1**Air Pollutants & Associated Health Concerns from Oil and Gas**

Methane, the primary component of natural gas, is over 80 times more potent than carbon pollution's projected disruption to our climate over the coming decades. Methane also contributes to ozone smog formation.

Toxic and Hazardous Air Pollutants include a wide range of chemicals that are known or probable carcinogens and/or cause other serious health impacts. Among other chemicals of concern, oil and natural gas facilities are responsible for the following air pollutants, either emitted as a component of raw natural gas or a by-product of natural gas combustion that occurs at these sites. Exposure studies based on air measurements have identified levels of benzene, hydrogen sulfide, and formaldehyde near oil and gas sites that exceed health-based thresholds.

- **Benzene** has been linked to cancer, anemia, brain damage, and birth defects, and it is associated with respiratory tract irritation.²² Over time, benzene exposure can also lead to reproductive, developmental, blood, and neurological disorders. A 2012 study estimated a 1.0 in a million cancer risk—well over EPA's level of concern—for residents near a well pad, attributable primarily to benzene levels measured in the air near the well site.²³ The EPA's National Emissions Inventory (NEI) estimates that over 20,000 tons of benzene was emitted by oil and gas sources in 2011.²⁴ Benzene is a constituent of raw natural gas, so leaks and vents are the primary source of benzene pollution from the oil and gas industry.
- **Ethylbenzene** has been associated with respiratory and eye irritation, as well as blood and neurological disorders.²⁵ The NEI estimates that over 2,000 tons of ethylbenzene was emitted by oil and gas sources in 2011.²⁶ Like benzene, ethylbenzene is a constituent of raw natural gas and leaks and vents of gas are the primary sources of ethylbenzene.
- **Hydrogen sulfide** gas is primarily found near wells producing "sour gas." At high concentrations, it can cause severe respiratory irritation and death. At lower levels, it can lead to eye, nose, and throat irritation; asthma attacks; headaches, dizziness, nausea, and difficulty breathing.²⁷
- **Formaldehyde** has been linked to certain types of cancer, and chronic exposure is known to cause respiratory symptoms.²⁸ The NEI estimates that nearly 22,000 tons of formaldehyde was emitted by oil and gas sources in 2011.²⁹ Formaldehyde is primarily emitted from combustion sources such as flares and compressor engines.

Volatile Organic Compounds (VOCs) are precursors to ground level ozone smog. Ozone smog can impair lung function, trigger asthma attacks, and aggravate conditions of people with bronchitis and emphysema.³⁰ Children, the elderly, and people with existing respiratory conditions are the most at risk from ozone pollution.

BOX 2

Air Pollution Sources in the Oil and Gas Industry

The oil and gas industry includes a large number of industrial sites across the country. These include hundreds of thousands of wellpads where oil and gas are produced, thousands of compressor stations which move natural gas from wells to markets, and hundreds of processing plants which prepare gas for high-pressure pipelines that take it to markets.

Raw natural gas (i.e., gas as it is produced from underground formations, before significant processing is done) usually contains significant amounts of ozone-forming volatile organic compounds (VOCs) and often contains significant amounts of toxic hazardous air pollutants (HAPs), though gas varies in composition from source to source. The HAPs in raw gas include hexane, benzene, and other aromatic chemicals; poisonous gases like hydrogen sulfide can also be present. As such, natural gas wellpads and the natural gas gathering pipeline and compression systems that move gas from wells emit substantial amounts of VOCs and HAPs, as do the processing plants that separate natural gas liquids (VOC species that are valuable components of raw natural gas) from the natural gas that is sent through pipelines to customers. Some of those pollutants remain in the gas even after processing. Emissions from facilities further downstream in the natural gas supply chain, like transmission compressor stations and local distribution equipment, still include some of these pollutants.

Crude oil production operations also emit substantial amounts of VOCs and HAPs. Methane, as the main constituent of natural gas, is emitted from all types of oil and natural gas facilities, from wellpads to the natural gas distribution systems in urban areas.

- **Oil and Gas Production:** The oil and gas production segment includes many diverse activities, such as production of hydrocarbons from underground geologic formations; separation of natural gas, oil, and water; and collection of gas from multiple wells through natural gas gathering pipeline and compressor systems. These activities in turn involve processes such as well drilling, hydraulic fracturing or other well stimulation, and well workovers; and they require equipment such as tanks, piping, valves, meters, separators, dehydrators, pipelines, and gathering compressors.
- **Natural Gas Processing:** Gas processing plants separate raw natural gas into natural gas liquids and processed natural gas that meets specifications for transport in high-pressure pipelines and consumption in furnaces and power plants. Natural gas liquids are hydrocarbons such as propane, butane, etc., which are valuable products of gas processing. The processing removes most of the toxic components from the gas, but some toxins remain.
- **Natural Gas Transmission and Storage:** Natural gas transmission pipelines carry gas from production regions to markets. This segment also includes facilities where gas is stored, either underground or in tanks. Compressor stations along pipelines maintain pressure and provide the energy to move the gas.
- **Natural Gas Distribution:** Finally, natural gas is delivered to customers (residential, commercial, and light industrial) via low-pressure underground distribution pipelines.
- **Oil Refineries:** Refineries are large industrial plants that process crude oil into various petroleum products, such as gasoline, diesel fuel, jet fuel, and others. Emissions of toxic and hazardous pollution from these facilities are very high, while methane emissions are relatively small.

CHAPTER 2

Health Impacts from Natural Gas Facilities

Natural gas facilities emit toxic air pollution and pollution that forms ozone smog. In two previous reports, “Fossil Fumes” and “Gasping for Breath,” CATF presented the public health impact of toxic air

“Just because the oil company brings jobs and other benefits, doesn’t mean it can do it at the expense of my health and well-being.”

— Charles Zacharie, Baldwin Village resident, Los Angeles, CA³²

pollution and ozone smog, respectively, from the natural gas industry. Here, we break out and discuss the public health impacts of these pollutants specifically for African American communities.

The health impacts described in this chapter are the result of air pollution that is directly due to natural gas facilities and equipment (for impacts of

petroleum refineries, see Chapter 3).³¹ As noted above, we are not fully accounting for the public health impact of natural gas development: water pollution and soil contamination can also have a significant public health impact, as can ancillary activities such as increased truck traffic. As such, the impacts presented in this chapter should be understood as minimum amount of impact; the true public health impact of natural gas development is certainly much higher.

In this chapter, we discuss the following public health impacts of natural gas facilities:

- Excessive concentrations of ozone (smog)
- Increased risk of cancer due to toxic air emissions.

The air in many African American communities violates air quality standards for ozone.

High ozone levels are caused by emissions from a variety of industries, but it is possible to separate out the increase in ozone that can be directly attributed to emissions from natural gas facilities and its associated health impact.³³ CATF’s “Gasping for Breath” describes an ozone modeling analysis that compares ozone levels in a 2025 “Baseline” case and a 2025 “Zero Natural Gas Emissions” case. The difference in ozone levels between these two cases is the ozone that can be directly attributable to natural gas.³⁴

The increased level of ozone can be associated with an increase in a variety of health impacts. The EPA uses peer-reviewed literature to estimate how these changes in ozone will affect public health.³⁵ Using the same studies and methodology as the EPA used in its recent Ozone National Ambient Air Quality Standards (NAAQS) rulemaking process, CATF’s ozone modeling estimates the impact on public health that can be directly attributable to ozone caused by emissions from the natural gas sector. Nationally, CATF estimates that over 750,000 asthma attacks for children and over 500,000 lost school days during the summer ozone season are due to ozone increases resulting from natural gas emissions.³⁶ After adjusting these total incidence rates based on the county level African American population, the African American population is burdened by approximately 138,000 asthma attacks and 101,000 lost school days attributable to natural gas air pollution each year. The burden of these health impacts falls more heavily on populations that already

FIGURE 4
Number of Asthma Attacks Experienced by African American Children Caused by Ozone
Attributable to Oil and Gas by Metropolitan Area

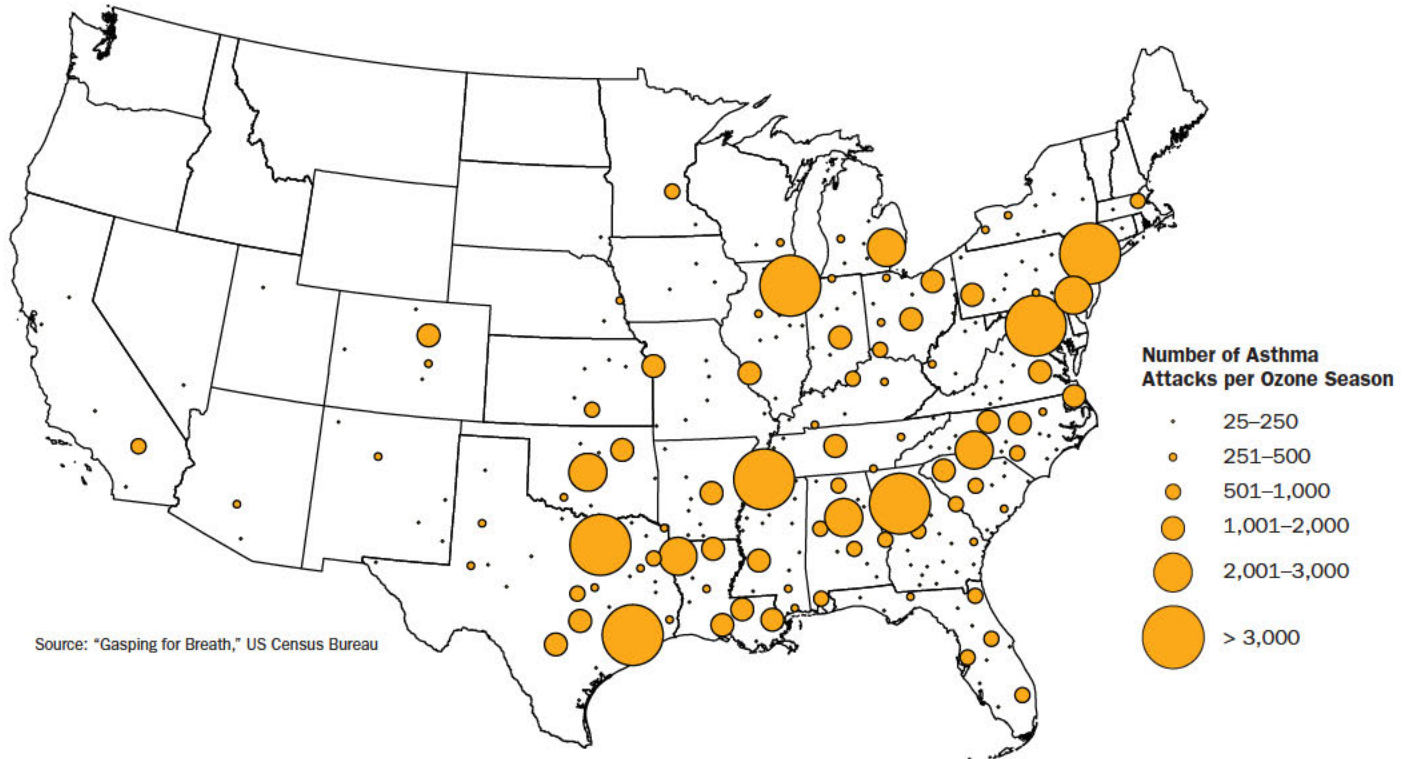


TABLE 2
Top 10 Metropolitan Areas by African American Health Impacts Attributable to Ozone
caused by Natural Gas Pollution

Metropolitan Area	Asthma Attacks (per year)	Lost School Days (per year)
Dallas-Fort Worth (TX, OK)	8,059	5,896
Atlanta (GA)	7,499	5,469
Washington-Baltimore (DC, MD, VA, WV, PA)	7,216	5,269
New York-Newark (NY, NJ, CT, PA)	5,235	3,821
Houston (TX)	4,256	3,111
Chicago (IL, IN, WI)	3,777	2,760
Memphis (TN, MS, AR)	3,674	2,692
Philadelphia (PA, NJ, DE, MD)	2,887	2,104
Shreveport-Bossier City (LA)	2,536	1,871
Detroit (MI)	2,402	1,751
National African American Total	137,688	100,564

Source: "Gasping for Breath," US Census Bureau

have high levels of asthma or who are already systemically oppressed. Figure 4 on page 15 shows the number of asthma attacks due to natural gas air pollution among African American children in metropolitan areas across the county each year.³⁷

Two of the ten metropolitan areas with the most asthma attacks attributable to natural gas ozone pollution are located in Texas: the areas in

and around Dallas and Houston. The Shreveport, Louisiana metropolitan area is located near natural gas production. In addition, the air pollution from natural gas facilities has a large impact on some metropolitan areas that are located far from natural gas producing regions, like in Atlanta, Washington DC, New York, Chicago, Memphis, Philadelphia, and Detroit.

CASE STUDY

Downwind Air Pollution in the Mid-Atlantic Baltimore, MD

While health risks are greatest near the original sources of pollution, airborne pollution from oil and gas facilities can have health impacts far downwind. The air pollution from natural gas facilities in Pennsylvania and West Virginia has had significant impacts on air quality in Maryland, particularly in the Baltimore—District of Columbia (D.C.) corridor where there is a high concentration of African Americans and other people of color.

A 2015 study from the University of Maryland evaluated the longer-term and long-range effects of hydraulic fracturing on regional air pollution. The study analyzed hourly measurements of air pollutants, including ethane—gases found in natural gas mixtures—in Baltimore and Washington, D.C. between 2010 and 2013. It found that ethane measurements increased by 25 percent between 2010 and 2013 in the region. Ethane is the second-most abundant compound in natural gas, which when inhaled can cause nausea, headaches, and dizziness. While there has been an overall decline in non-methane organic carbons and improvement in air quality since 1996, the atmospheric concentration of ethane in the region managed to rise between 2010 and 2013.³⁸

Maryland officially banned the practice of hydraulic fracturing in 2017, although even before the ban, hydraulic fracturing was a rare practice. After comparing the rise in ethane to natural gas extraction in neighboring states, the researchers found a correlation. After tracking the wind direction, distribution, and speed in the Marcellus shale play region, researchers determined that Baltimore and other areas in Maryland and Washington DC were on the tail end of natural gas emissions originating from sites in Pennsylvania, West Virginia, and Ohio.

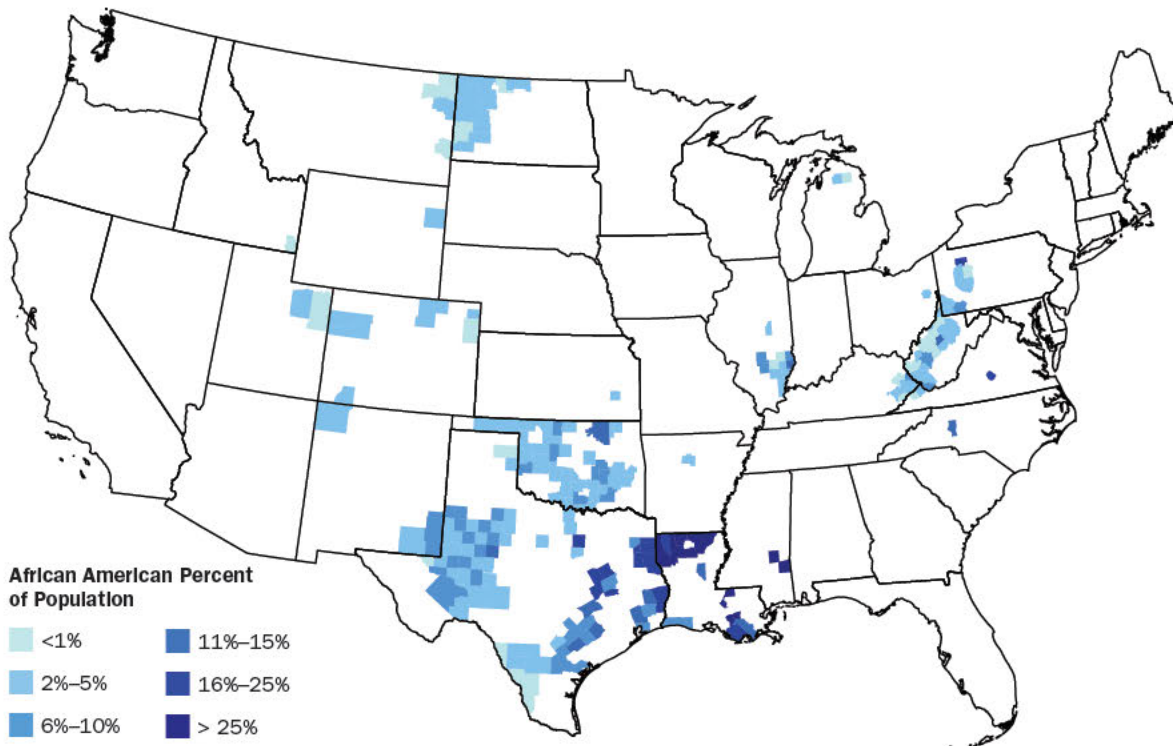
In 2015, people in Baltimore experienced 89 days of elevated smog, and on 20 days it was at unhealthy levels, increasing the risk of premature death, asthma attacks, and other adverse health impacts.³⁹ Baltimore is a predominately African American city, with African Americans accounting for 63 percent of the city's population. The city's fence-line neighborhoods have a history steeped in toxic fumes, industry dumping, and hazardous air pollutants. The impacts of methane and other gases from out of state have further worsened of air quality in these communities and the entire region. With poor air quality already, residents of Baltimore should not also be exposed to pollution from oil and gas development in other states.

COMMUNITY STORY

“Over 200 cities in Texas have local ordinances regulating oil and gas activity where people are living with these consequences. Cities all over Texas have ordinances regulating things like reasonable distances for drilling away from neighborhoods. They have rules to protect fresh water to decide where pipelines can be constructed. They even regulate where trucks can drive and the hours in which facilities can operate and these are all locally regulated... Ordinances like Dallas’s and any of the other ordinances across Texas could be overturned as soon as the company sues the city and future ordinances have to move industry standards.... This is a human rights violation because people pass these laws to protect their health and safety from explosions and to prevent water and air pollution and the state agencies and the federal government will not. It was a power grab and it weakens our most democratic institution.”

— Melanie Scruggs, TX

FIGURE 5
African American Percent of Population in Counties above EPA's Level of Concern for Cancer Risk from Oil and Gas Emissions



Source: “Fossil Fumes,” U.S. Census Bureau

Many African American communities face an elevated risk of cancer due to toxic air emissions from natural gas development.

In the EPA’s National Air Toxics Assessment (NATA), the EPA identifies and prioritizes air toxics, emission source types, and locations that are of greatest potential concern when looking at health

risk from air emissions in populations. NATA estimates cancer risk that can result from toxic air emissions. The metric for cancer risk is the number of cancer cases per million people exposed; areas with cancer risk above one-in-a-million are considered to be above EPA’s level of concern. In CATF’s *Fossil Fumes* report, 238 counties in

21 states faced a cancer risk above EPA's one-in-a-million level of concern due to toxic emissions from natural gas operations.⁴⁰ In 2015, over 9 million people lived in these counties, of whom 1.1 million were African American.

Of the African Americans living in counties above EPA's level of concern for cancer risk, most live in Texas, Louisiana, and Oklahoma.

The inventory that our analysis relied on, the National Emissions Inventory, may underestimate the total emissions of toxics from natural gas.⁴¹ Many peer-reviewed studies based on independent measurements conducted in both natural gas producing basins and urban areas consuming natural gas have concluded that official emissions

inventories such as the National Emissions Inventory (NEI) underestimate actual emissions from natural gas.

While the cancer risk estimates are based on the EPA's most recent NEI projections, there is still a degree of uncertainty regarding emissions levels reported to the NEI. For example, in 2015, an expert review analysis in California identified the need to update emissions estimates, particularly in relation to understanding health threats for communities in the Los Angeles Basin. Thus, while no counties in California are above EPA's level of concern in the current analysis, this may be a result of underestimated emissions reported to EPA, not an actual indication of low risk levels.

TABLE 3
Top 10 States with African American Population Living in Counties Above EPA's Level of Concern for Cancer Risk (2015 Population Data)

State	Number of Counties Above EPA's Level of Concern for Cancer Risk	Total Population in High Risk Counties	Total African American Population in High Risk Counties	Percent of Population in High Risk Counties that is African American
Texas	82	4,189,179	528,357	13%
Louisiana	19	1,027,556	354,952	35%
Oklahoma	40	796,695	37,130	5%
West Virginia	28	804,850	30,589	4%
Pennsylvania	8	624,764	25,071	4%
North Carolina	1	169,866	22,682	13%
Mississippi	2	37,135	17,039	46%
Colorado	6	419,023	7,458	2%
Illinois	13	205,829	7,417	4%
New Mexico	3	247,495	7,093	3%
Total	238	9,086,228	1,050,372	12%

Source: "Fossil Fumes," US Census Bureau

COMMUNITY STORY

"Oil and gas development poses more elevated health risks when conducted in areas of high population density, such as the Los Angeles Basin, because it results in larger population exposures to toxic air contaminants."

— The California Council on Science & Technology

CASE STUDY

A History of Urban Drilling

Inglewood Oilfield, Inglewood, CA

Los Angeles has a long history of urban oil drilling. Across Los Angeles, drilling pumps can be found in and near public parks, as well as throughout commercial and residential areas. The 1000-acre Inglewood Oil Field, operated by Freeport-McMoRan Oil and Gas, is one of the largest urban oil fields in the United States. The field contains 959 wells that extract over three million barrels of oil a year. The environmental hazards of this urban drilling have caused countless environmental and public health issues, lawsuits, and community actions.

Inglewood oil field, located in the north-western area of the Los Angeles Basin, has more than one million residents within five miles of the oil field. 50,000 households sit immediately next to the field.⁴² Many of these fence-line communities are predominately communities of color. The neighborhoods surrounding the oilfield include Baldwin Hills, Inglewood, and Culver City neighborhoods, which together are 50 percent African American. Residents and local organizations surrounding the Inglewood Oil Fields have expressed concerns about the environmental, health, and seismic effects of drilling in their community. Given the proximity of the oil field to residential areas, emissions from the site result in continuous human exposure.

People have detailed smelling diesel or industrial smells, as well as soapy smelling odor suppressants. A number of advocacy groups in Los Angeles, including the coalition Stand Together Against Neighborhood Drilling (STAND L.A.), have called for a 2,500 foot setback requirement for oil facilities to protect the health and safety of nearby residents. This distance is on the lower end of the range researchers have recommended as necessary to protect human health and quality of life from the impacts of toxic emissions and exposures.⁴³ Although community groups and members have come forward about the toxic nature of the fumes and other air pollutants coming from the Inglewood oilfield, local decision makers have not addressed these concerns, claiming that the public health impacts of this air pollution are still unknown.⁴⁴



Oil wells in a residential neighborhood in Los Angeles.

© CATF



Oil wells in a residential neighborhood in Los Angeles.

© CATF

CASE STUDY

Uneven Responses to Community Oil and Gas Air Pollution

Los Angeles, CA

Not only are the rates of health impacts from oil and gas facilities drastically different between communities, so is local and state responses to air pollution from these facilities. Low-income and communities of color seldom receive the same amount of attention as higher income, white communities when faced with major pollution related events. From October 2015 to February 2016, the affluent, suburban Los Angeles neighborhood of Porter Ranch experienced the worst reported methane leak in the United States. The \$400,000 plus homes inside gated communities are located a mile away from the Aliso Canyon natural gas storage facility, which leaked a total of 96,000 metric tons of methane as well as other air pollutants over the course of five months.⁴⁵ This pollution caused many to experience symptoms including vomiting, rashes, headaches, dizziness, and bloody noses.⁴⁶

With the declaration of a state of emergency from Governor Jerry Brown, came an overwhelming response. Over 4,000 households in Porter Ranch were evacuated. Alongside community and state insistence for the shut-down of the facility, the city ordered the gas company to provide temporary housing for residents. As the largest methane leak in U.S. history, the Porter Ranch disaster, unique in its size and suddenness, deserved a substantial response. However, Los Angeles residents who live right next to some of the 5,000 active drilling sites in the city—disproportionately low-income communities of color—have dealt with similar issues for years and deserve a similar response to their plight.⁴⁷

Oil operations look a lot different in low-income communities of color, where drilling sites are often adjacent to residential areas. Jefferson Park, a South L.A. neighborhood impacted by drilling, is 90 percent African American or Latinx. This is in stark contrast to Porter Ranch, where the majority of the population is white and median household income is more than triple that of Jefferson Park and other neighborhoods.⁴⁸

The AllenCo drilling site in Jefferson Park—now closed but pending reopening—was 30 feet away from the nearest home. Residents filed hundreds of complaints about odors, nausea, body spasms, and respiratory illnesses, before the site was finally closed in 2013.⁴⁹ Despite the efforts of community members, the site was only closed after EPA officials became sick while investigating the site. Communities across Los Angeles have faced the same burdens from urban oil and gas drilling faced by the residents of Porter Ranch. The major difference is the amount of time and the nature of the response. Other communities have faced these health impacts for decades, with no evacuations or government response.

CHAPTER 3

Health Impacts from Oil Refineries

In this chapter, we include case studies and stories of community members that have been impacted by pollution from oil refineries. We do not quantify health impacts from oil refineries, as we did for impacts from natural gas facilities, but the case studies demonstrate the range of impacts that are felt by fence-line communities around the country. In addition, in this chapter, we focus solely on petroleum refineries, not the entire petroleum supply chain.

Refineries release toxic air pollution in communities in 32 states. This toxic mix of carcinogens, neurotoxins, and hazardous metals—such as benzene, hydrogen cyanide, and lead—can cause cancer, birth defects, and chronic conditions like asthma. While about 90 million Americans live within 30 miles of at least one refinery, 6.1 million Americans live within three miles of one refinery or more.⁵⁰ There are even cases, similar to natural gas and other oil facilities, where houses are a mere few feet away from refinery property lines.

There are 142 large refineries in the United States, the majority of which are sited in low-income areas and communities of color. In 2010, oil refineries reported approximately 22,000 tons of hazardous air pollution to the U.S. Environmental Protection Agency (EPA).⁵¹ However, this number fails to take into account unreported emissions from refinery sources, like flares, tanks, and cooling towers, as well as accidents, which can release 10 or even 100 times more pollution than what is reported.⁵² Proximity to oil refineries and other oil and gas facilities also poses serious risk during natural disasters. Air pollution from refineries during and after extreme weather events severely impacts fence-line communities. As during Hurricane

Harvey in August 2017, refineries in the Houston, TX metro area released thousands of pounds of toxic air pollutants, resulting in further evacuations and curfews for local residents. The full impact of these chemical released during natural disasters and other events are often immeasurable.

While about 90 million Americans live within 30 miles of at least one refinery, 6.1 million Americans live within three miles of one refinery or more.

Oil refineries are one of numerous plights for African American and other fence-line communities, who are subject to the environmental burdens of the fossil fuel industry. People of color, including African Americans and Hispanic Americans, have a higher cancer risk from toxic air emissions from refineries than the average person. Risk factors are increased when also looking at adults living in poverty.

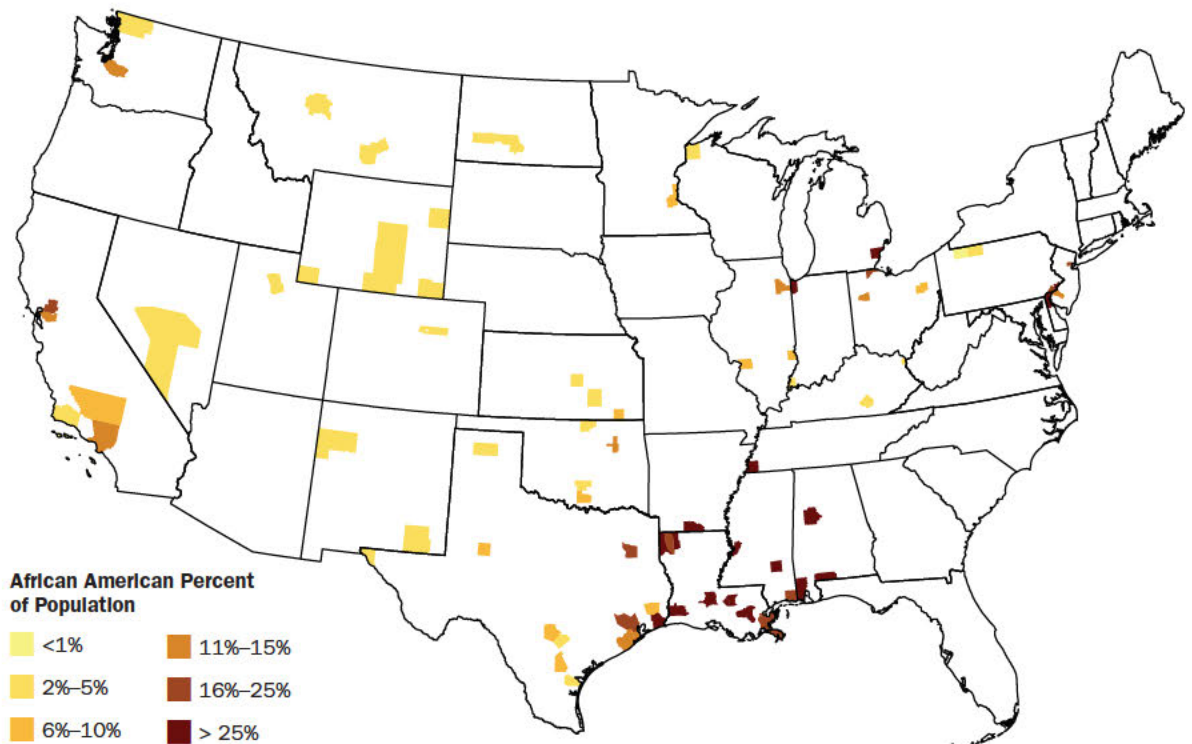
- Most counties with oil refineries and higher percentages of African American residents are concentrated in the Gulf Coast Basin (Texas, Louisiana, Alabama, and Mississippi).
- Texas, California, and Pennsylvania have the most African American residents living in counties with oil refineries.
- Michigan, Louisiana, and Tennessee have the highest percent of African American residents living in oil refinery counties.

Figure 6 (p. 22) shows the percent of African Americans in U.S. counties with oil refineries.

This chapter highlights the health impacts of oil refinery air pollution on predominately African American fence-line communities—communities that sit adjacent to polluting facilities and sources. We do not quantify health impacts using atmospheric models, as we did for air pollution from

natural gas facilities, as we did in Chapter 2. However, through case studies in Port Arthur, Texas; Baton Rouge, Louisiana; East Bay, California; and South Philadelphia, Pennsylvania we explore the various impacts oil refinery operation and related events impact African American and fence-line communities.

FIGURE 6
African American Percent of Population in Counties with Oil Refineries



Source: U.S. Census, Energy Information Administration Form 820

TABLE 4
Top 10 States by African American Population Living Counties with Oil Refineries

State	Total Population in Refinery Counties	African American Population in Refinery Counties	Percent African American in Refinery Counties
Texas	8,973,679	1,397,018	16%
California	13,060,074	1,302,860	10%
Pennsylvania	2,214,144	848,064	38%
Michigan	1,759,335	712,290	40%
Louisiana	1,358,443	540,435	40%
Tennessee	938,069	509,942	54%
Alabama	657,160	228,846	35%
New Jersey	847,265	173,852	21%
Delaware	556,779	148,994	27%
Ohio	913,279	146,192	16%
Total	39,793,311	6,709,206	17%

Source: U.S. Census, Energy Information Administration Form 820

CASE STUDY

East Bay Refinery Corridor

East Bay, CA

The burden placed on communities of color in the north coast of the East Bay region, which is home to a variety of petrochemical industry sites, cannot be ignored. The five petroleum refineries in this region emit a unique cocktail of toxic and carcinogenic compounds that impact cardiovascular health of surrounding communities. This region, nicknamed the “refinery corridor,” has a petroleum refining capacity of roughly 800,000 barrels per day of crude oil.⁵³ While there have been many strides to clean up these major sources of air pollution, health impacts in the region, including cancer rates, are still disproportionately high. The City of Richmond’s residents of color disproportionately live near the refineries and chemical plants.

CASE STUDY

Burdens of a Fence-Line Community: Valero Oil and Gas Refinery

West Port Arthur, TX

On the border of Texas and Louisiana lies the city of Port Arthur, Texas, which houses two notorious oil refineries: a 3,600-acre Motiva Enterprises plant, to the northeast, and a 4,000-acre plant owned by Texas-based Valero to the west. The two facilities refine more than 900,000 barrels of crude per day. Like many Gulf Coast cities and towns, Port Arthur is not only exposed to the hazards of neighboring oil and gas infrastructure, it is also downwind of nearly every coastal refinery in Texas, as well as other industrial facilities.⁵⁴

The western Valero refinery—one of the largest in the world—borders West Port Arthur, a predominately African American community (95 percent African American in 2013) with several complexes of low-income public housing that exist directly on the refineries’ fence. For decades, West Port Arthur’s enormous refineries have released and leaked benzene, carbon monoxide, sulfur dioxide, and other pollutants. The U.S. Environmental Protection Agency’s Toxics Release Inventory ranks Jefferson County, Texas among the worst nationally for chemical emissions known to cause cancer, birth defects, and reproductive disorders. Port Arthur is near the top of the list of offending cities.⁵⁵ According to the Texas Cancer Registry, cancer rates among African Americans in Jefferson County are 15 percent higher than for the average Texan. The mortality



The Carver Terrace housing project sits next to an oil refinery in West Port Arthur, Texas.

© AP Photo/LM Otero



Valero Refinery
In West Port Arthur,
Texas

© Eugene Richards, On Earth

rate from cancer is more than 40 percent higher.⁵⁶ In addition to higher cancer rates, residents of Port Arthur were found to be four times more likely than people approximately 100 miles upwind to report suffering from heart and respiratory conditions; nervous system and skin disorders; headaches and muscle aches; and ear, nose, and throat ailments.⁵⁷

Community activists in Port Arthur have been fighting against the refineries polluting their communities' air for more than a decade. Organizations, such as the Community in-Power Development Association (CIDA, Inc.), work with community members in Port Arthur to collect and analyze air, water, and soil samples, conduct direct action events, lobby local and state legislatures, and hold large industries accountable for the pollution they create. CIDA has won many victories alongside other local groups in Port Arthur. In 2007, CIDA Inc. was able to negotiate an agreement for the Valero oil refinery to assist with health care cost for residents West Port Arthur residents and for the construction of a health clinic in the community.⁵⁸

The organization, with other major environmental groups, helped establish the national Start-up Shut-down and Malfunction (SSM) Law for refineries. SSM removes exemptions for large industrial pollution sources from meeting protective standards during facility start up, shutdown, or malfunction and bars the use of the "affirmative defense" by industrial facilities—the defense allowed facilities to avoid paying penalties if violations occurred because of malfunctions.⁵⁹

— CONTINUED —

COMMUNITY STORY

“Our communities have had to work hard to force the EPA to do something about the hazardous pollution from these refineries that we live with every day and we will keep fighting to protect our families’ and our children’s health. We refuse to just stand by while the petroleum industry tries to undo important progress to finally reduce the toxic air coming from oil refineries.”

— Hilton Kelley, executive director of Community In-Power & Development Association, Port Arthur, TX

Challenges to SSM were denied by the Supreme Court in the summer of 2017.⁶⁰ The role of community organizations, like CIDA Inc., as well as community members themselves was critical and preserving this law.

In addition to air pollution from refinery operations, those from accidents and natural disasters must also be acknowledged. Air pollution from refineries during and after extreme weather events severely impacts fence-line communities. During Hurricane Harvey, in September 2017, many oil refineries along the Gulf Coast of Texas and Louisiana shutdown due to severe flooding. Refinery shutdowns, even under normal circumstances, are a major cause of abnormal emission events. Sudden shutdown events can release large plumes of sulfur dioxide or toxic chemicals in a matter of hours, worsening already life-threatening situations, exposing downwind communities to peak levels of pollution that increase the prevalence of negative health conditions.⁶¹ The Port Arthur community was not spared these extra pollutants in the wake of this storm.

The ills brought onto the West Port Arthur community violate basic human rights to a clean and livable environment. Air pollution from oil and gas facilities, permitted or otherwise, is a continued violation of this basic right.

A video by Hilton Kelley, a local Port Arthur environmental and community activist, and Executive Director of CIDA Inc., shows Valero refinery towers spewing huge flags of orange fire and thick, black smoke into over West Port Arthur.

CASE STUDY

Toxic Emission in South Philadelphia Pennsylvania, PA

Impacts are also severely felt by communities in South Philadelphia that share a neighborhood with the Philadelphia Energy Solutions (PES), the largest fossil fuel refinery on the East Coast and one of the oldest in the world. The refinery is responsible for 72 percent of the toxic air emissions in Philadelphia, which contributes largely to a citywide childhood asthma rate that is more than two times the national average.⁶² Toxics released from the refinery include ammonia, hydrogen cyanide, benzene, and sulfuric acid, which cause effects ranging from headaches to cancer.⁶³



Philadelphia Energy Solutions (PES) fossil fuel refinery in South Philadelphia.

© Grid Magazine

CASE STUDY

Accidents at Oil and Gas Facilities: ExxonMobil Refinery

Baton Rouge, LA

In 2010, there was significant increase in air pollution released due to accidents at oil and gas refineries in Louisiana. That year, facilities released 950,750 pounds of toxic pollution to the air. Between 2005 and 2014, Louisiana's refineries experienced 3,339 accidents that released 24 million pounds of air pollution. According to the Louisiana Bucket Brigade, from January to April 2017 there have been 647 petrochemical accidents. 117 of these accidents were reported from oil and gas facilities in April 2017 alone.⁶⁴ These accidents are common for the majority of oil and gas facilities nationwide. Leaks, holes, ruptures in pipelines and other infrastructure are common and often unreported. Over 200,000 people live within two miles of most of Louisiana's refineries. The potential public health impacts of oil and gas accidents is considerable.

In an effort to document the impact of petrochemical accidents on local communities, a number of community and labor groups in Louisiana—including the Louisiana Bucket Brigade, United Steelworkers, Standard Heights Community Association, and Residents for Air Neutralization—have produced a series of reports entitled, *Common Ground*, since 2009. The fourth publication, released in 2012, found that Louisiana's 17 oil and gas refineries reported 301 accidents that leaked over a million pounds of toxic chemicals into the air. Among these air pollutants were large quantities of benzene, a chemical known to cause cancer, and sulfur dioxide, which triggers asthma attacks. These types of accidents are an ongoing burden for Louisiana's vulnerable populations.

ExxonMobil, one of the many petrochemical companies present in Louisiana, reported the most accidents of any refiner in the state, in 2011. The company reported 138 accidents between two of its facilities in Chalmette and Baton Rouge. The 1,800-acre ExxonMobil Standard Heights plant in Baton Rouge, like many refineries, sits adjacent to a number of low-income and communities of color. The city of Baton Rouge is 50 percent African American and the child

— CONTINUED —

A mostly abandoned square of the Standard Heights neighborhood tucks into a corner of the Exxon Mobile plant in North Baton Rouge.



poverty rate in the Standard Heights neighborhood next to Exxon Mobil refinery is 45 percent. The Baton Rouge refinery is the second largest in the country and is part of a 67 million square foot (6.25 million m²) industrial complex. Tens of thousands of people live within two miles of the complex, which produces gasoline for much of the East Coast.⁶⁵

The state permits Exxon to release millions of pounds of air pollution each year from its Baton Rouge complex. However, air pollution exceeds allowed levels due to accidents and leaks. From 2008 to 2011 the Exxon Mobil Baton Rouge complex released four million pounds of unpermitted volatile organic compounds (VOCs).⁶⁶ VOCs contribute to increases in ozone concentration and smog. East Baton Rouge and adjacent parishes have teetered between normal and hazardous levels of ozone.

In 2016, the EPA finally indicated that the air quality in Baton Rouge was compliant with EPA standards. Despite this declaration, concerned community members still report accidents or otherwise unhealthy conditions. One citizen complaint received by the Louisiana Bucket Brigade in April 2017, detailed air contaminants from Exxon's Baton Rouge Refinery. One individual who lives close to the Exxon Refinery in north Baton Rouge, made 11 calls reporting:⁶⁷

- “foul gassy odor”
- “a strong odor of sulfur”
- “a smell that makes me sick of the stomach nauseous”
- “a flame that is burning real high and there’s a foul odor in the air”
- “a really strong odor that is like burning your nose.”

The constant release of air pollutants from oil and gas facilities, whether legal or illegal, intentional or accidental, contributes to the health problems plaguing African American and vulnerable communities. The efforts of local organizations in Louisiana to document accidents and make that information transparent to citizens has greatly benefited community action. Information gathered by community groups has been critical in the many actions against the construction of the Bayou Bridge Pipeline that will cut through more low income and communities of color in 11 South Louisiana parishes. To learn more about this pipeline and the impacts potential accidents may have visit the Louisiana Bucket Brigade website [here](#).

COMMUNITY STORY

“It’s often not worth risking a dangerous encounter in a small southern town to stop and record pollution. What we’re recording is another form of violence—this kind the long, steady attack of carcinogens and neurotoxins that ruin the health and the lives of those in Louisiana, usually African Americans, who are unfortunate enough to live cheek to cheek with Big Oil’s refineries.”

— Anna Rolfes, Founding Director, Louisiana Bucket Brigade

CHAPTER 4

Call to Action

Air pollution that affects many African American communities is emitted throughout the oil and gas sector. In the current regulatory environment, the disproportionate burden of pollution will only increase for low-income communities and communities of color. That means more “code red” air quality days, more trips to the emergency

Oil and gas infrastructure including drilling sites, pipelines, and refineries are typically located in low-income communities and communities of color. These are also the areas where drilling is likely to expand and new pipelines will likely be built.

room for asthma sufferers, and more instances of cancer and respiratory disease. It is critical to remember that:

- More than 1 million African Americans live within ½ mile of existing oil and gas facilities and the number is growing every year.
- Many African Americans are particularly burdened with health impacts from this air pollution due to high levels of poverty.
- The air in many African Americans communities violates air quality standards for ozone smog. Rates of asthma are relatively high in African American communities. And, due to ozone increases resulting from natural gas emissions, African American children are burdened by 138,000 asthma attacks and 101,000 lost school days each year.

- Many African American communities face an elevated risk of cancer due to air toxics emissions from natural gas development. Over one million Americans live in counties that face a cancer risk above EPA’s level of concern from toxics emitted by oil and gas facilities.
- 6.7 million African Americans live in counties with petroleum refineries.

Oil and gas infrastructure including drilling sites, pipelines, and refineries are typically located in low-income communities and communities of color. These are also the areas where drilling is likely to expand and new pipelines will likely be built. The energy industry has and continues to commit the same oppressive behaviors that have ravaged communities of color for centuries. In order to create an energy economy that upholds communities’ rights to a healthy environment, communities must demand changes in the oil and gas industry, and regulators and companies must be held accountable for the continued suffering of fence-line communities.

We must reform the energy and industrial sectors into cleaner, sustainable, and vibrant economies, that work for the communities they serve.

This means more than shifting to clean energy sources; it requires also giving local communities control over their energy sources and promoting local economic growth through stable employment opportunities. Intersectional issues demand intersectional solutions that uphold social, economic, and ecological justice. The just energy future will serve to reduce both the poverty and the pollution plaguing communities throughout the United States.

In order to combat the often overlooked, life-threatening actions of oil and gas operations, we must both implement commonsense standards that reduce pollution from these facilities, and transform the current energy economy.

It will take the combined effort of community members, decision-makers, industry, and others to create meaningful change, which is grounded in principles of energy democracy (local energy choice), energy sovereignty (local control over energy systems), and the right to live free from pollution. Before the transition to a clean energy economy can be achieved, it is first necessary to eliminate the injustices that are taking human life now. In the short term, more needs to be done to address the air pollution resulting from the oil and gas sector that harms the health of our families and our communities:

1. We must all learn about the oil and gas facilities that are located in our communities, and advocate for their decommissioning or removal.

Companies disproportionately build polluting facilities in or near communities of color, leading to unequal health impacts. In order to change this, we need to make more communities aware that their safety, health, and longevity are at stake. Go to www.oilandgasthreatmap.com to learn more about the oil and gas facilities that are located in your community. Be sure to learn about the impacts these facilities have in your community. The NAACP's Environmental and Climate Justice Program's publication, *Just Energy Policies and Practices Action Toolkit*, can be used to help guide community groups through energy justice campaigns. The toolkit provides resources and guidance for communities to organize around energy justice issues and execute community projects that move power back to communities and improve local quality of life. It is crucial to remember that any community can change, that every community can be healthy, and that every community has power.

It is now more important than ever for communities to become informed about and remove nearby polluting facilities. If the current administration has its way, the EPA's Office of Environmental



Completion equipment at a gas well.

Justice will be dismantled. The purpose of this office has been to ensure that all communities, regardless of race, national origin, or income, have the same degree of protection from environmental and health hazards. The loss of this office means one fewer safeguard from the unequal impacts of all types of air pollution.

2. We must support technology that cuts air pollution.

Many proven, low-cost technologies and practices are available to reduce methane pollution and toxic chemicals released along with it. In fact, dozens of companies in the methane mitigation industry are providing technologies and services to the oil and gas industry to help reduce methane and other air polluting emissions. These companies employ people at 531 locations in 46 states and are often offering well-paying and secure manufacturing jobs.⁶⁸ The companies that do this work can create jobs that should be targeted to local communities.



3. We must urge national leaders to address the pollution from the oil and gas sector.

Defending the methane pollution safeguards finalized during the Obama administration and pushing for additional protections against pollution from the oil and gas industry will help improve the health of many African American communities while also addressing global climate change. In June 2016, the EPA finalized strong methane standards covering new and modified oil and gas facilities. The rule will cut 510,000 tons of methane pollution from new and modified oil and gas facilities—the equivalent of 11 coal-fired power plants, or taking 8.5 million cars off the road every year. In addition, the rule is also expected to reduce 210,000 tons of volatile organic compounds and 3,900 tons of air toxics annually by 2025. These EPA standards must be enforced, and more also needs to be done to address the nearly 1.3 million existing oil and gas facilities across the country. Without government intervention, the vast majority, at least 75 percent, of all of the wells and oil and gas infrastructure in use today, will remain virtually unregulated and can continue to pollute methane without limit.⁶⁹

Existing facilities spewed over 8 million metric tons of methane in 2014—equivalent to 200+ coal-fired power plants.⁷⁰ Common sense, low-cost standards can both cut methane pollution by at least half and also significantly cut toxic and ozone smog-forming air pollution, which would have important benefits for air quality and public health in and downwind of oil and gas producing areas.

4. We must urge our states to reduce oil and gas air pollution.

Several states have stepped up to work on cleaning up the existing infrastructure within their borders, including California, Colorado, and Wyoming, and we call on additional states to follow their lead and protect the health of communities.

Please visit www.methanefacts.org to learn more and connect with organizations involved in the campaign.

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Environmental and energy justice issues are multilayered. Thus, the approach to tackling these issues must also be multilayered. People of color and low-income communities are disproportionately affected by exposure to air pollution, and standards that protect communities from this pollution are critical. In addition, these communities have a lot to gain from the transition from the current fossil fuel energy economy to one based on equitable, affordable, and clean energy sources. The first step is to address the many ways fossil fuels taint our communities, including the air pollution from oil and gas development.

The fight against the oil and gas air pollution is not about making things better for fence-line communities; it is about eliminating poverty, racism, and other social and structural inequities that render communities vulnerable. The air pollution that plagues communities across the country does not have to and should not exist. It is time to ask ourselves, what are we willing to do to ensure a clean and healthy future?

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Fumes Across the Fence-Line

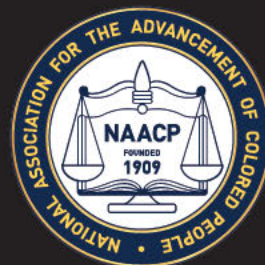
The Health Impacts of Air Pollution from Oil & Gas Facilities on African American Communities



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Environmental Justice Concerns and the Proposed Atlantic Coast Pipeline Route in North Carolina

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and Brooks Depro



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Abstract

This report describes publicly available data sets and quantitative analysis that local communities can use to evaluate environmental justice concerns associated with pipeline projects. We applied these data and analytical methods to two counties in North Carolina (Northampton and Robeson counties) that would be affected by the proposed Atlantic Coast Pipeline (ACP). We compared demographic and vulnerability characteristics of census blocks, census block groups, and census tracts that lie within 1 mile of the proposed pipeline route with corresponding census geographies that lie outside of the 1-mile zone. Finally, we present results of a county-level analysis of race and ethnicity data for the entire North Carolina segment of the proposed ACP route. Statistical analyses of race and ethnicity data (US Census Bureau) and Social Vulnerability Index scores (University of South Carolina's Hazards & Vulnerability Research Institute) yielded evidence of significant differences between the areas crossed by the pipeline and reference geographies. No significant differences were found in our analyses of household income and cancer risk data.

Introduction

The Atlantic Coast Pipeline, LLC, (ACP) is a new underground natural gas transmission pipeline project that is proposed to run approximately 600 miles through West Virginia, Virginia, and North Carolina (Atlantic Coast Pipeline to build \$5 billion natural gas system, 2015). In August 2016, the Federal Energy Regulatory Commission (FERC) established an environmental review timeline that included the delivery of draft and final environmental impact statements (EISs) required by the National Environmental Policy Act (NEPA). One of the purposes of EISs is to provide a “full and fair discussion of significant environmental impacts and ... inform decision makers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment” (40 C.F.R. § 1502.1, 1978). The draft EIS was prepared by FERC and released in late December 2016, marking the start of a 90-day public comment period. The final EIS was published in July 2017.

Since 1997, existing federal guidance (Council on Environmental Quality, 1997; Clinton, 1994) indicates that EIS documents should address environmental justice in minority populations and low-income populations. To help achieve this goal during the NEPA process, the Federal Interagency Working Group on Environmental Justice established the NEPA Committee to “improve the effective, efficient and consistent consideration of environmental justice issues in the NEPA process through the sharing of best practices, lessons learned, research, analysis, training, consultation, and other experiences of federal NEPA practitioners” (US Environmental Protection Agency [EPA], 2016b, p. 6). The NEPA Committee’s recently published *Promising Practices* report provides researchers with examples of methods that are used to consider environmental justice during NEPA processes (EPA, 2016b).

In the spirit of the *Promising Practices* report, we developed this report, which describes quantitative methods local communities may find useful for evaluating environmental justice concerns with respect to pipeline projects. Our basic methodology

compares the characteristics of census blocks, block groups, and tracts that lie within a 1-mile zone of the proposed route with corresponding census geographies that lie outside of the 1-mile zone. We have conducted the analysis for two counties (Northampton and Robeson) that would be affected by the proposed ACP.

Rather than focus on the environmental impacts of the pipeline itself, our study looks at preexisting characteristics of communities that would be in the path of this infrastructure project. We evaluate whether ACP would disproportionately burden certain groups of people more than others, simply by virtue of its alignment. Natural gas pipelines and appurtenant pipeline operations facilities can impose a variety of environmental burdens on the communities that they cross. Potential impacts include: visual impacts; adverse effects on sensitive flora and fauna; damage to water supply sources during construction activities;* intensive water usage during construction; wetland impacts (primarily during construction); forest fragmentation; noise impacts from compressor stations and meter and regulating stations; air quality impacts and related health concerns resulting from compressor station emissions; land use restrictions for properties crossed by the pipeline; and increased risk to life and property from pipeline explosions (FERC, 2016; US Department of Health and Human Services, Agency for Toxic Substances and Disease Registry [ATSDR], 2016a, 2016b; Brown, Lewis, & Weinberger, 2015; Brown, Weinberger, Lewis, & Bonaparte, 2014; Macey et al., 2014; Smith, 2015).† Through various mitigation efforts, these impacts can be reduced, but not entirely eliminated. At a minimum, a community that hosts a pipeline faces heightened risk of accidents during construction and operation.

Although none of the ACP’s potential impacts would directly alter the demographic or environmental characteristics examined in this study, our results provide valuable contextual information for

* Damage can result from trenching in areas with shallow groundwater or from accidentally spilling hazardous materials used by construction equipment, like fuels, solvents, or lubricants (FERC, 2016).

† Pipeline explosion risk can vary over time as infrastructure ages and operators modify pipeline pressure in response to fluctuating market demand.

evaluating whether potential impacts are equitably distributed. Our approach aligns with the NEPA Committee's recommendation to compare the general population's exposure to adverse impacts with the exposure of minority and low-income populations (EPA, 2016b). Impacts that are "predominantly borne by minority populations or low-income populations" may be disproportionately high and adverse (EPA, 2016b, p. 46). In considering preexisting environmental burdens, this study also responds to the NEPA Committee's call for scrutiny of any impact that "occurs in minority populations and low-income populations affected by cumulative or multiple adverse exposures from environmental hazards" (EPA, 2016b, p. 46).

In addition, our study offers the following benefits:

- Uses publicly available census data that can be easily accessed on the Internet
- Employs simple classical statistical methods
- Makes available our computer code for external review and replication
- Uses new environmental and social vulnerability data not considered in the ACP's draft EIS.

The analysis in this report is designed to be shared with all interested parties to establish a common understanding of demographic, environmental quality, and vulnerability data and the analytical methods used to understand environmental justice.

Methods

To start the analysis, we acquired maps of the proposed pipeline route through Northampton and Robeson Counties from Atlantic (the pipeline company) on October 19, 2016, and November 17, 2016, respectively (Dominion, 2017). Using a geographic information system (GIS), we geo-referenced the pipeline route maps and created a GIS shapefile of the pipeline for each county. The proposed location of the compressor station in Northampton County was added to the GIS in the same manner.

Next, to identify populations that live near potential impacts, we mapped a 1-mile "study zone" around the proposed pipeline route. The selected distance is

the same distance FERC (2016) uses for demographic analysis. A review of recent compressor station impact analyses also suggested that a 1-mile distance was appropriate for capturing the area that could be affected by the proposed Northampton County compressor station (ATSDR, 2011, 2016a; Brown et al., 2014; Madison County Department of Health, 2014). The zone was then overlaid with census geographies (blocks, block groups, and tracts) to determine which geographies are located wholly or partially within the 1-mile area. Appendix A provides maps of the 1-mile zone and selected census data sets.

In the last step before the quantitative comparisons, we collected income, race/ethnicity, and vulnerability characteristics at various geographic scales: census blocks, census block groups, census tracts, and counties. Tracts are composed of census block groups, each with a population of between 600 and 3,000 people. Census block groups are, in turn, partitioned into census blocks, which are the smallest geographic boundaries defined by the census. Census blocks are defined using landscape features and property or legal boundaries (US Census Bureau, 2012a, 2012b; Rossiter, 2011).

To determine whether there was a statistically significant difference between income, race/ethnicity, and vulnerability characteristics for geographies within the 1-mile zone relative to geographies outside the zone, we used common classical statistical methods such as comparison of means with *t*-tests. For comparisons of mean household incomes, we had to perform additional steps to account for sampling errors associated with the American Community Survey (ACS) by calculating test statistics using the following equation provided by the US Census Bureau (n.d.):

$$Z = (A - B) / ([SE(A)]^2 + [SE(B)]^2)^{1/2},$$

where

- *Z* is the test statistic,
- *A* is the mean household income of census tracts (or block groups) lying within the zone,
- *B* is the mean household income of census tracts (or block groups) lying outside the zone,

- SE(A) is the standard error of the mean household income of census tracts (or block groups) lying within the zone, and
- SE(B) is the standard error of the mean household income of census tracts (or block groups) lying outside the zone.

Income Data

Appendix B provides ACS 2010–2014 5-year data estimates for aggregate income. The draft EIS reports median income data and the total percentage of the population living below the poverty level (FERC, 2016, Appendix U). For both variables, however, FERC omits the standard errors that the ACS uses to measure the difference of a sample estimate from the average of all possible samples. Because some of these standard errors are large relative to the sample estimate (see Table 1), researchers need to acknowledge the uncertainties associated with sampling and how they influence FERC’s analysis conclusions. In addition, when making group comparisons and performing statistical tests of

differences, researchers must consider standard errors when performing certain calculations for statistical tests.

Race/Ethnicity Data

We downloaded 2010 decennial census block-level race and ethnicity data (Table P5, Hispanic or Latino Origin by Race) from American FactFinder (US Census Bureau, 2017). Because census block-level data are only reported for the decennial census, these were the most recent data we could obtain. We examined three variables at the census block level: black or African American, American Indian and Alaska Native (AI/AN), and Hispanic or Latino. The US Census Bureau considers “Hispanic or Latino” to be an ethnicity and the other two variables to be races. Because the US Census Bureau’s definition of ethnicity overlaps with race identity, some of the individuals who were included in our analysis of “Hispanic or Latino” populations were also included in our race variable analyses. Although analyzing each demographic group separately provides a more detailed picture of the populations that are affected

Table 1. Income and poverty data, as reported in ACS 2010–2014 5-year estimates for census tracts within 1 mile of proposed pipeline route

County	Census tract number	Median income of individuals in past 12 months	Standard error: median income of individuals in past 12 months	Population with poverty status below 50% of poverty level	Standard error: population with poverty status below 50% of poverty level	Population with poverty status of 50%–99% of poverty level	Standard error: population with poverty status of 50%–99% of poverty level
Northampton	9201	\$24,813	\$1,872	374	124	463	134
Northampton	9203	\$17,625	\$1,263	651	151	1145	264
Robeson	9601.01	\$17,859	\$1,915	857	241	888	235
Robeson	9601.02	\$17,449	\$1,516	474	105	658	138
Robeson	9602.01	\$19,557	\$1,310	592	221	730	172
Robeson	9602.02	\$18,844	\$1,121	656	165	805	173
Robeson	9603	\$16,283	\$1,013	1,292	325	1,792	268
Robeson	9604.01	\$17,623	\$1,759	1,821	387	992	210
Robeson	9604.02	\$19,864	\$3,253	540	150	536	144
Robeson	9605.01	\$17,737	\$2,879	541	163	626	181
Robeson	9606	\$17,718	\$1,139	942	205	1,039	192
Robeson	9607.01	\$19,694	\$2,124	1,080	221	1,150	286

Note: All dollar amounts are in 2014 US dollars.

Source: US Census Bureau (2014): Tables B06011 (median income columns) and C17002 (poverty-level columns).

by the proposed pipeline route, the potential for double-counting precludes composite analyses of those data. For race variables, we excluded data from individuals who reported multiple races; we counted only individuals who identified as AI/AN alone or black or African American alone. Tables 2 and 3 present descriptive statistics for race and ethnicity

data for each county as a whole, as well as population tallies inside and outside the 1-mile zones. Figures 1 and 2 illustrate the population distribution of the largest demographic group in each county: black or African American (Northampton County) and AI/AN (Robeson County).

Table 2. Census block race/ethnicity data for Northampton County, by zone

1-mile zone	Black/African American		White		American Indian/Alaska Native (AI/AN)		Hispanic/Latino	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Outside	10,593	54.9	8,216	42.6	82	0.4	287	1.5
Inside	2,303	82.2	452	16.2	19	0.7	18	0.6
Total	12,895		8,668		101		305	

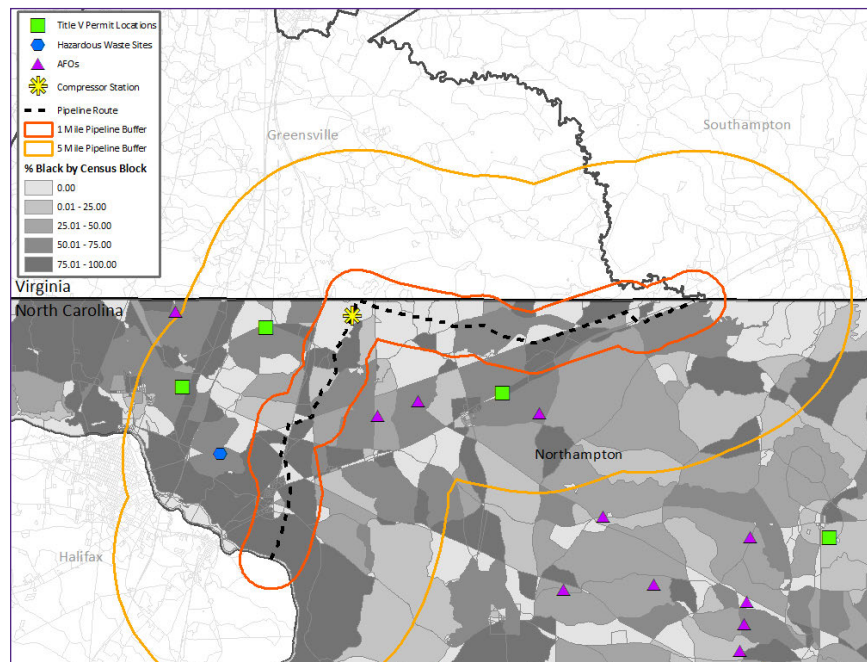
Source: US Census Bureau (2010).

Table 3. Census block race/ethnicity data for Robeson County, by zone

1-mile zone	Black/African American		White		American Indian/Alaska Native (AI/AN)		Hispanic/Latino	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Outside	31,344	25.4	36,469	29.5	46,009	37.2	9,276	7.5
Inside	1,293	12.3	2,408	22.8	5,493	52.1	1,656	15.7
Total	32,637		38,877		51,502		10,932	

Source: US Census Bureau (2010).

Figure 1. Percentage of black or African American residents, by census block, the proposed pipeline route and zone, and selected facilities of interest in Northampton County



Source: US Census Bureau (2010); North Carolina Department of Environmental Quality (2016a, 2016b); North Carolina Division of Waste Management, Hazardous Waste Section (2016).

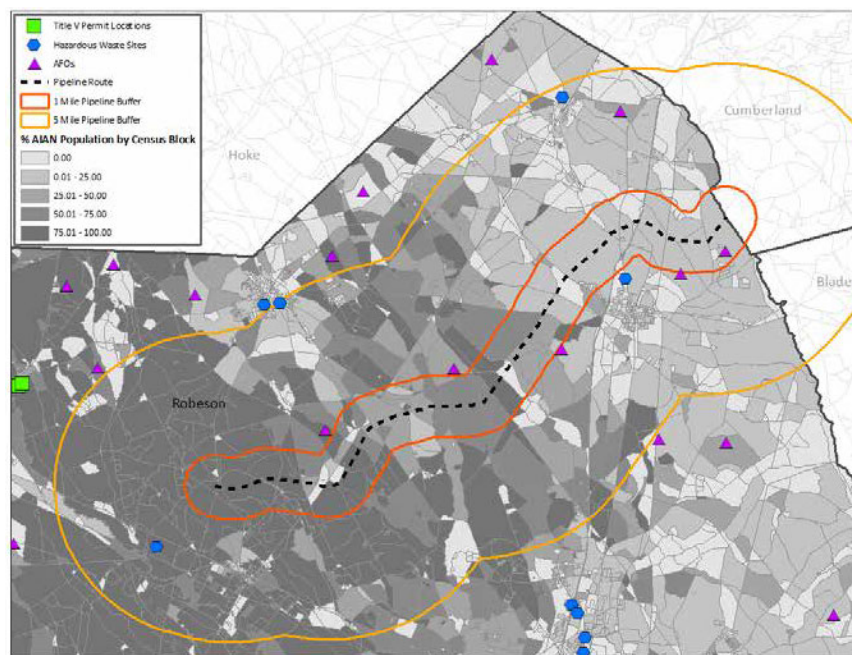


Figure 2. Percentage of American Indian and Alaska Native residents, by census block, the proposed pipeline route and zone, and selected facilities of interest in Robeson County

US Census Bureau (2010); North Carolina Department of Environmental Quality (2016a, 2016b); North Carolina Division of Waste Management, Hazardous Waste Section (2016).

Vulnerability Data

In addition to the demographic characteristics associated with the pipeline route, we worked with community advocates to identify various vulnerability indicators: a social vulnerability index, cancer risk, and preexisting facilities with the potential to contribute to environmental justice concerns (animal feeding operations [AFOs] facilities, hazardous waste sites, and facilities with Title V air quality permits). With the exception of hazardous waste sites, none of these indicators that we analyzed were incorporated into the draft EIS.

The first indicator is a general social vulnerability measure developed by the University of South Carolina (USC) Hazards & Vulnerability Research Institute. The 2006–2010 Social Vulnerability Index (SoVI) is a widely used index comprising 27 variables (drawn primarily from decennial and ACS census data), which are collectively associated with patterns in communities’ natural hazard preparedness,

response, and recovery (USC, 2017; Dunning & Durden, 2013).[‡] Higher index scores suggest greater social vulnerability and lower resilience to natural hazards (Table 4).

The second indicator is cancer risk. We obtained cancer risk data from the most recent (2011) EPA (2016a) National Air Toxics Assessment (NATA) (Table 5). NATA uses emissions data to model ambient and exposure concentrations of various air pollutants and estimate cancer risk and noncancer health impacts resulting from chronic inhalation exposure (EPA, 2015). Total cancer risk is reported as the likelihood that several people (out of a million) would develop cancer if exposed continuously (24 hours per day) to current (modeled) pollutant concentrations over 70 years (an assumed lifetime) (EPA, 2015).

[‡] The foundation of SoVI index scores is principal components analysis. For more information about its calculation, see USC (2017) and USC (2011).

Table 4. Descriptive statistics for 2006–2010 Social Vulnerability Index values in all census tracts in Northampton and Robeson Counties

County	Number of tracts	Mean	Median	Minimum	Maximum	Standard deviation
Northampton	5	2.56	1.75	0.90	5.15	1.86
Robeson	31	5.80	5.83	-0.01	10.31	2.78

Source: University of South Carolina, Hazards & Vulnerability Research Institute (2010).

Table 5. Descriptive statistics for total cancer risk in all census tracts in Northampton and Robeson Counties

County	Number of tracts	Mean	Median	Minimum	Maximum	Standard deviation
Northampton	5	36	36	34	40	2.5
Robeson	31	41	38	36	62	6.6

Source: 2011 National Air Toxics Assessment (EPA, 2016a).

Lastly, we noted the presence of facilities with the potential to contribute to environmental justice concerns. From the North Carolina Department of Environmental Quality (NCDEQ), we obtained a list of AFO facilities that were permitted as of November 4, 2016 (NCDEQ, 2016b). We geocoded and mapped all facilities with active permits, regardless of size.[§] The North Carolina Division of Waste Management, Hazardous Waste Section (2016) publishes a geospatial data set with the locations of all hazardous waste facilities regulated under the federal Resource Conservation and Recovery Act. We used the shapefile (dated March 4, 2016) to map the permitted facilities. Finally, under the Clean Air Act, Title V operating permits are required of all major sources of air pollution, as well as some minor sources. The permits specify what measures each source needs to take to control its air pollution (EPA, 2017). We downloaded from the NCDEQ website a list of all facilities in North Carolina with Title V permits as of November 15, 2016 (NCDEQ, 2016a). We plotted facility latitude/longitude coordinates in ArcMap. Tables 6 and 7 present counts of each type of facility in relation to the 1-mile zone for Northampton and Robeson Counties.

[§] North Carolina General Statute § 143–215.10B defines “animal operations” as follows: “any agricultural feedlot activity involving 250 or more swine, 100 or more confined cattle, 75 or more horses, 1,000 or more sheep, or 30,000 or more confined poultry with a liquid animal waste management system, or any agricultural feedlot activity with a liquid animal waste management system that discharges to the surface waters of the State” (North Carolina General Assembly, 2017).

Table 6. Numbers of animal feeding operations (AFOs), hazardous waste facilities, and Title V facilities in relation to the 1-mile zone: Northampton County

1-mile zone	AFOs	Hazardous waste facilities	Title V facilities
Outside	21	2	4
Inside	0	0	0
Total	21	2	4

Source: NCDEQ (2016a, 2016b); North Carolina Division of Waste Management, Hazardous Waste Section (2016).

Table 7. Animal feeding operations (AFOs), hazardous waste facilities, and Title V facilities in relation to the 1-mile zone: Robeson County

1-mile zone	AFOs	Hazardous waste facilities	Title V facilities
Outside	46	20	4
Inside	5	1	0
Total	51	21	4

Source: NCDEQ (2016a, 2016b); North Carolina Division of Waste Management, Hazardous Waste Section (2016).

Results

For income comparisons within each county, we did not find differences in mean household incomes** in areas within the 1-mile zone compared with areas outside of the zone. However, we did detect differences in most of the race/ethnicity populations included in our study.

Unlike the income and race/ethnicity data, the vulnerability data collected for this study did not lend themselves well to statistical testing. Almost no AFOs, hazardous waste facilities, or Title V facilities were

** We chose to focus on mean income data because the statistical testing procedures for evaluating median income data (as reported in the ACS) were too complex for the scope of this study.

located within the 1-mile zone. We compared only the SoVI and cancer risk data in Robeson County because sample sizes were too small in Northampton County. We found SoVI indices were higher in the 1-mile zone, but cancer risks were similar inside and outside of the zone.

Comparisons of Income Data

In the Northampton and Robeson Counties census-tract analyses, our calculations produced test statistics of 1.34 and -0.53, respectively. Because these test statistics fall between the critical Z-values of -1.645 and 1.645 (90 percent confidence level), we cannot conclude that there is a statistically significant difference in the mean household income of the census tracts lying within the 1-mile zone and those lying outside of the zone for either Northampton County or Robeson County. In other words, we do not detect differences in the mean household incomes for the groups inside and outside of the 1-mile zone.

At a finer geography level, census-block groups, the test statistics obtained for Northampton and Robeson Counties are -0.69 and -1.08, respectively. We cannot conclude that there is a statistically significant difference (at the 90 percent confidence level) between the mean household income of census block groups lying within the zone and the mean household income of census block groups lying outside the zone for either county.

Comparisons of Race and Ethnicity Data

In Northampton County, we performed a *t*-test comparing mean percentages of black residents in census blocks inside and outside the 1-mile zone, and we performed a similar test for AI/AN populations. Both tests yielded statistically significant results, with *t*-statistics of -5.2036 and -2.2541, respectively. These results indicate that the mean percentages of black or African American and AI/AN residents inside the 1-mile zone are statistically higher than outside the zone at the 95 percent confidence level. Performing a similar test for Hispanic/Latino populations yielded a *t*-statistic of 1.3523 (falling within the critical values of -1.645 and 1.645), so we cannot conclude there is a statistically significant difference (at the 95 percent confidence level) between mean percentages of

Hispanic/Latino residents inside versus outside the 1-mile zone. The *t*-tests performed are statistically significant for black or African American, AI/AN, and Hispanic/Latino populations in Robeson County, with *t*-statistics of 4.0633, -9.0788, and -4.8019, respectively, suggesting a statistically significant difference (at the 95 percent confidence level) between the mean percentages of each race or ethnicity variable inside versus outside the 1-mile zone. In particular, the mean percentage of black or African American residents is higher outside the 1-mile zone, whereas the mean percentages of AI/AN and Hispanic/Latino residents are higher inside the 1-mile zone.

Community advocates who reviewed the preliminary findings of our study noted that our analysis of 1-mile zones within counties may mask broader-scale geographic inequities in route selection. To address this concern, we conducted a supplemental county-level comparison analysis by examining the percentage minority population^{††} in the North Carolina counties along the proposed pipeline route relative to the rest of the counties in the state. A two-sample test of proportions yielded a Z-statistic of 348.6521, with an associated one-tailed test *p*-value of 0.000. Therefore, at the 95 percent confidence level, we can conclude that the counties crossed by the proposed ACP route collectively have a significantly higher percentage minority population than the rest of the counties in the state.

Comparison of Vulnerability Indicators

Only Robeson County has a sufficient number of census tracts to permit statistical comparison of the SoVI scores and cancer risk within the 1-mile zone ($n = 10$) versus outside the 1-mile zone ($n = 21$) tracts. We used a two-sample *t*-test with equal variances to compare the mean SoVI values of the census tracts inside and outside the 1-mile zone. We used a two-sample Wilcoxon rank-sum test to compare cancer risk in Robeson County census tracts within the 1-mile zone and outside of the zone. The

^{††} Using 2010 decennial census data, we calculated the proportion minority population by tallying the number of white, non-Hispanic/Latino individuals; dividing by the total population; and then subtracting from 1.

Robeson County SoVI analysis yielded a *t*-statistic of -1.7768 and a one-tailed test *p*-value of 0.043, so at the 95 percent confidence level, we can conclude that the mean SoVI score of census tracts inside the zone is significantly higher than the mean SoVI score of census tracts outside the zone. The Robeson County cancer risk test yielded a *p*-value of 0.2719; we therefore cannot conclude that there is a statistically significant difference (at the 95 or 90 percent confidence level) in cancer risk between zone and nonzone census tracts.

Discussion

The draft EIS claims that because “impacts would occur along the entire pipeline route and in areas with a variety of socioeconomic backgrounds,” there is consequently “no evidence that [the pipeline] would cause a disproportionate share of high and adverse environmental or socioeconomic impacts on any racial, ethnic, or socioeconomic group” (FERC, 2016, p. 4:413). FERC does not explain the factual basis for this conclusion; the criteria for establishing “disproportionate impact” on populations are not stated in the document.

Our test results suggest that in Northampton County disproportionately large numbers of AI/AN residents and black or African American residents live within 1 mile of the pipeline route, whereas in Robeson County, disproportionately large numbers of AI/AN residents and Hispanic/Latino residents live within 1 mile of the pipeline route. Our county-level demographic analysis points to broader-scale spatial inequities. If pipeline risks are indeed uniform along the entire route, as FERC (2016) argues in its environmental justice analysis, then our analysis provides evidence of disproportionate exposure of certain groups to pipeline impacts. In Robeson County, the census tracts within 1 mile of the pipeline route also have a significantly higher mean SoVI score relative to census tracts outside of 1 mile of the pipeline route.

Conclusions

This study adds value to the conversation about the ACP’s environmental justice implications by presenting several analyses not accounted for in the draft EIS. In drafting its environmental justice analysis for the project, FERC focused exclusively on census tract-level data and did not conduct any statistical comparisons. Rather, FERC (2016) compared minority and low-income populations with reference thresholds, namely a 50 percent minority population threshold for a census tract, a census tract threshold of 10 percentage points above the county’s minority population, and the state poverty level. By statistically comparing data and extending the analysis to smaller geographic units, we provide additional evidence of the differences in demographic characteristics of the communities that are located within 1 mile of the pipeline route compared with communities located farther away.

Our study also raises the issue of and investigates the spatial relationships between demographic data and various environmental burdens, whereas FERC (2016) considered only the pipeline’s spatial relationship to minority and low-income populations.

Another contribution of this research is its emphasis on transparency and replicability. All of the data used in this study are publicly available. We packaged and distributed our raw data, GIS files, and statistical test logs for public use before publishing this report. We hope that these materials will assist community advocates who are studying the pipeline’s potential impacts.

There are several directions for future research. First, we recommend extending these methods to other counties crossed by the proposed pipeline route and experimenting with a second study zone (e.g., 10-mile zone, 20-mile zone) to define the comparison group for statistical testing. Ideally, county-by-county analysis should be complemented with an aggregate analysis of all affected census blocks, block groups, and tracts along the entire North Carolina segment of the pipeline route (by contrast, this study’s analysis of the full North Carolina route used county-level data only).

Second, community advocates who reviewed the preliminary findings of this study suggested the need for a larger-scale analysis. The analysis would compare the current proposed route with older proposed and rejected routes to illustrate how environmental justice concerns varied with the changes in the proposed routes.

Third, although our research team incorporated additional social and environmental variables, the analysis could be strengthened by investigating the spatial distributions of other preexisting

stressors, especially health concerns (e.g., heart disease, cancers related to nonrespiratory exposure pathways, diabetes) and environmental conditions (e.g., floodplains, landfills, brownfields, water quality impairments, coal ash facilities, and waste deposits). Such analysis would ideally form part of a quantitative and qualitative evaluation of cumulative impacts and aggregate environmental risks to vulnerable communities, including those that are physically distant from the proposed route but have strong sociocultural connections to the area.

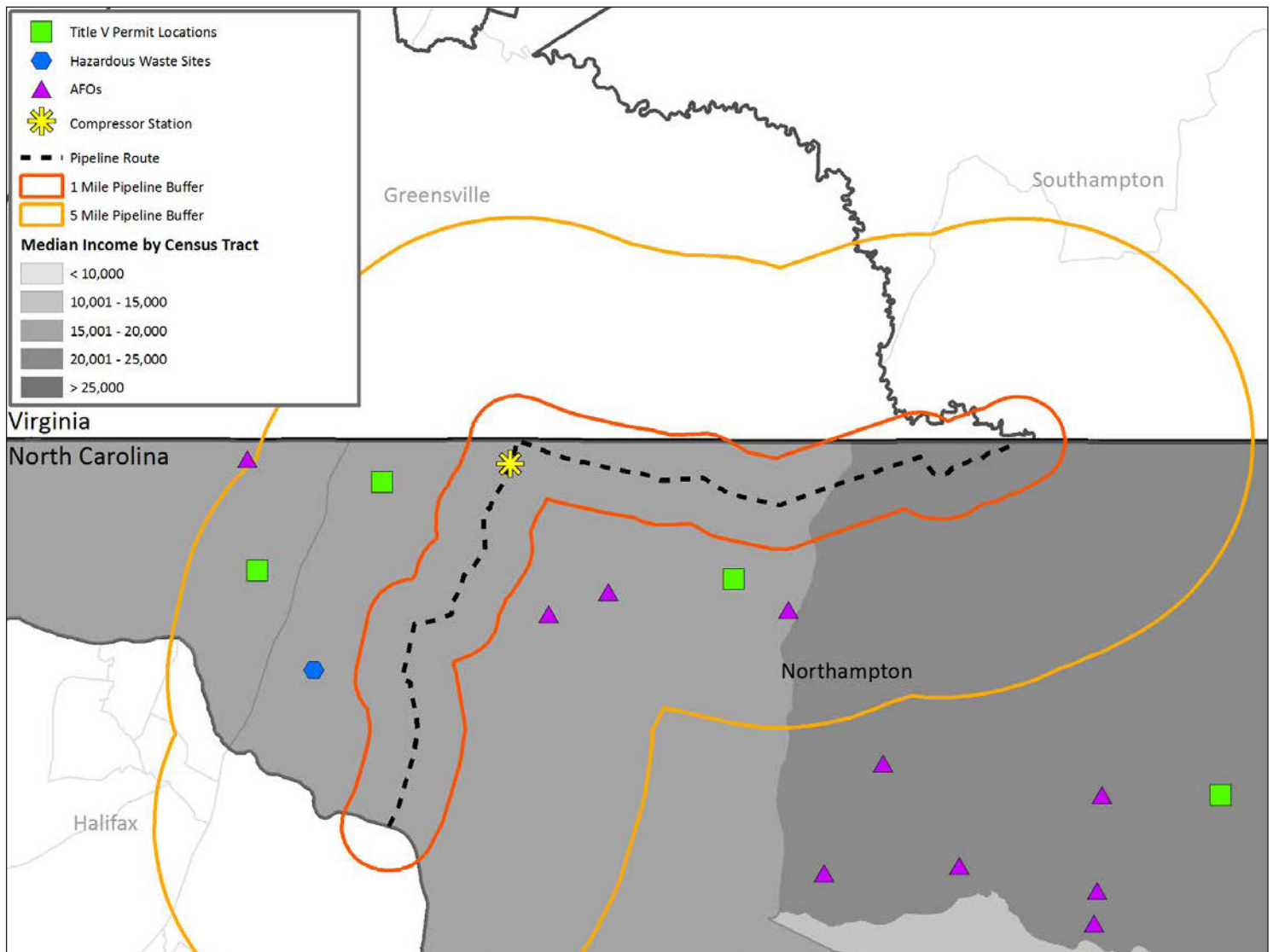
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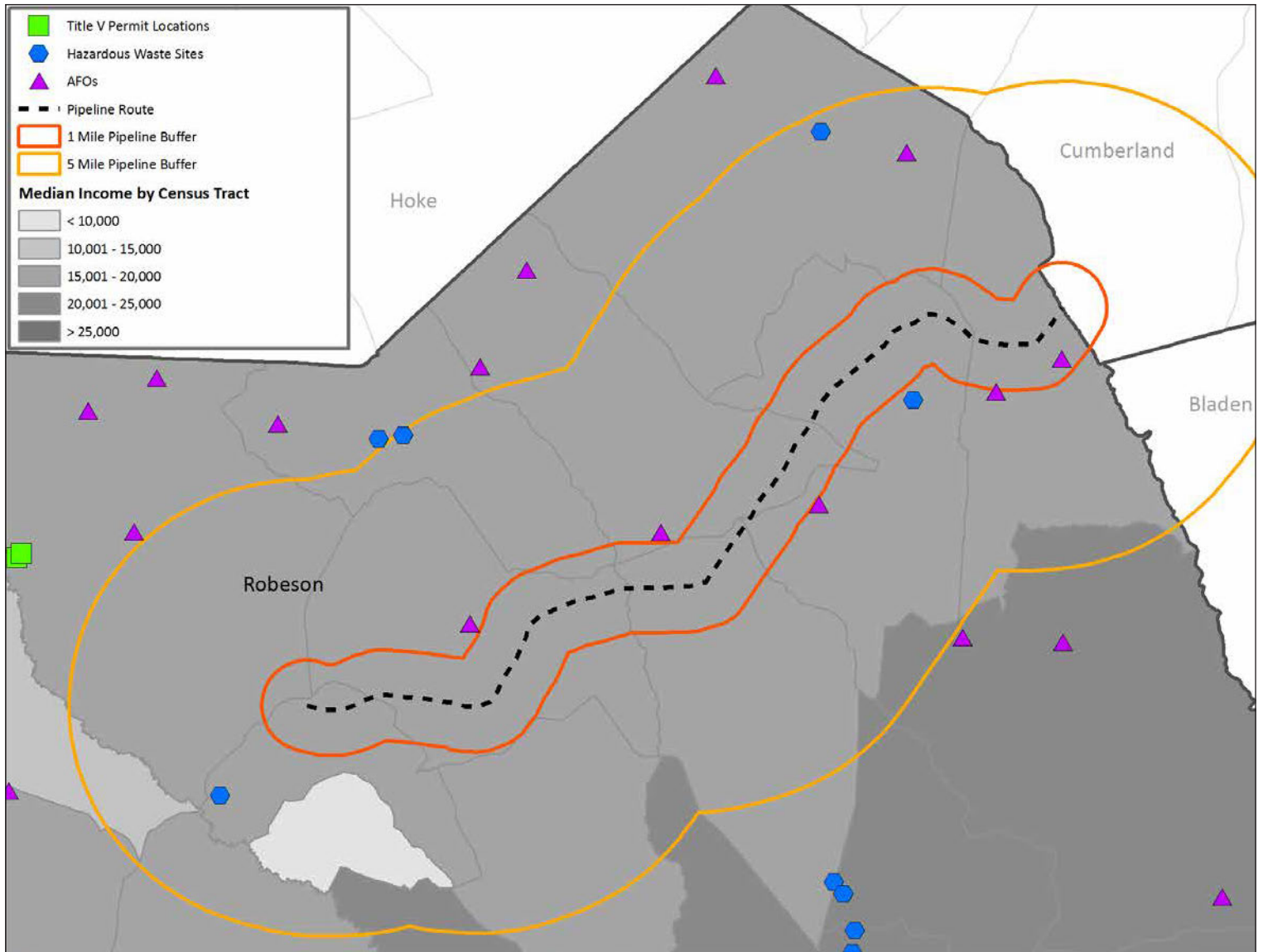
Appendix A

Figure A1. Proposed pipeline route with selected facilities of interest and median income, by census tract, Northampton County



Source: US Census Bureau (2014): Table B06011; North Carolina Department of Environmental Quality (2016a, 2016b); North Carolina Division of Waste Management, Hazardous Waste Section (2016).

Figure A2. Proposed pipeline route with selected facilities of interest and median income, by census tract, Robeson County



Source: US Census Bureau (2014): Table B06011; North Carolina Department of Environmental Quality (2016a, 2016b); North Carolina Division of Waste Management, Hazardous Waste Section (2016).

Appendix B

Table B1. Northampton County aggregate income and household tallies, census tract data

1-mile zone	Number of households		Aggregate household income over past 12 months (2014 dollars)	
Outside	4,100	47.9%	\$165,604,200	44.4%
Inside	4,464	52.1%	\$207,032,600	55.6%
Total	8,564	100.0%	\$372,636,800	100.0%

Table B2. Northampton County aggregate income and household tallies, census block group data

1-mile zone	Number of households		Aggregate household income over past 12 months (2014 dollars)	
Outside	6,582	76.9%	\$293,028,700	78.6%
Inside	1,982	23.1%	\$79,608,000	21.4%
Total	8,564	100.0%	\$372,636,700	100.0%

Table B3. Robeson County aggregate income and household tallies, census tract data

1-mile zone	Number of households		Aggregate household income over past 12 months (2014 dollars)	
Outside	27,823	61.2%	\$1,205,425,400	61.8%
Inside	17,623	38.8%	\$745,044,000	38.2%
Total	45,446	100.0%	\$1,950,469,400	100.0%

Table B4. Robeson County aggregate income and household tallies, census block group data

1-mile zone	Number of households		Aggregate household income over past 12 months (2014 dollars)	
Outside	35,465	78.0%	\$1,541,616,600	79.0%
Inside	9,981	22.0%	\$408,852,500	21.0%
Total	45,446	100.0%	\$1,950,469,100	100.0%

Source: US Census Bureau (2014): Tables B19001 and B19025.

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LETTERS

Edited by Jennifer Sills

Flawed environmental justice analyses

In December 2016, the Federal Energy Regulatory Commission (FERC) issued a draft environmental impact statement (DEIS) for the Atlantic Coast Pipeline, a natural gas pipeline proposed to run approximately 1000 km from West Virginia to end points in Virginia and North Carolina (1). The developer, a partnership of utility corporations, contends that the project is needed to meet the region's growing energy needs.

The proposed route crosses territories of four Native American tribes in North Carolina. Because poor and minority communities have long been excluded from environmental decision-making (2), all federal agencies must now identify and address environmental justice issues during formal assessments and reviews of projects such as the Atlantic Coast Pipeline (3). Such projects can have wide-ranging impacts on human communities associated with land rights and property values, public safety in the event of leaks and explosions, and regional climate change exacerbated by fugitive methane emissions (4) and combustion of natural gas.

In addition to these issues, Native American tribes have unique concerns deriving from their status as indigenous peoples. Tribes have deep connections to ancestral and modern-day territories, and these connections are often important to tribal concepts of identity, history, culture, spirituality, and governance. Sacred sites, archaeological resources, and natural

features integrate to form cultural landscapes that are unique to each tribe.

The Atlantic Coast Pipeline developer's preferred route disproportionately affects indigenous peoples in North Carolina. The nearly 30,000 Native Americans who live within 1.6 km of the proposed pipeline make up 13.2% of the impacted population in North Carolina, where only 1.2% of the population is Native American [Appendix U in (1)]. Yet, the DEIS reported that fewer than half of the areas along the proposed route had minority populations higher than county-level baseline proportions (1). The discrepancy stems from the DEIS's failure to account for large differences in population size in the studied areas; large minority populations in some places were masked by much smaller nonminority populations elsewhere. The analysis also failed to account for large differences in baseline demographics among counties, where minority populations range from less than 1% to nearly 70% [Appendix U in (1)]. These large differences prevented meaningful comparisons among areas in different counties. Together, these flaws rendered FERC's analysis incapable of detecting large Native American populations along the route, leading to false conclusions about the project's impacts. Notably, the analysis conformed to the generic guidelines prescribed by the U.S. Environmental Protection Agency (1).

Environmental justice analyses are meant to help regulators and developers identify and address disparate impacts on vulnerable populations at an early stage in the decision-making process (3, 5, 6). Analyses unable to detect such impacts are essentially faulty instruments that fail to warn decision-makers about potential problems ahead. In the case of the Atlantic Coast Pipeline, a

Members of North Carolina's Lumbee tribe prepare to perform a traditional dance in 2004. Their lands lie in the path of the planned Atlantic Coast Pipeline.

more thorough analysis might have alerted regulators to large Native American populations along the proposed route and the need to consult with tribal governments.

The Dakota Access Pipeline controversy (7) demonstrates that all parties suffer when environmental justice analyses and tribal consultation are treated as meaningless rote exercises. Tribes suffer erosion of sovereignty and damage to cultural landscapes, federal-tribal relations deteriorate, and developers incur setbacks.

Developers and regulators of the Atlantic Coast Pipeline still have a window of opportunity to take these lessons to heart. Regulators can consult with tribes before making a final decision on the project later this year, and they can acknowledge the project's true impacts on vulnerable populations by addressing the flawed environmental justice analysis. Scientists can help by sharing rigorous methods, providing oversight, and partnering with vulnerable communities. It is not too late to work toward environmental justice for all.

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Mexico's basic science funding falls short

During his inauguration address in December 2012, Mexico's President Enrique Peña Nieto vowed to move the country forward by investing in education as well as in science and technology (S&T). In two government documents (1, 2), he pledged to increase the S&T federal expenditure (which had been lingering for years at about 0.4% of the gross domestic product) up to a minimum of 1% by 2018 (2, 3). A few months earlier, the National Autonomous University of Mexico, together with the

Comments to the Federal Energy Regulatory Commission on the Draft Environmental Impact Statement for the Atlantic Coast Pipeline, LLC, Dominion Transmission, Inc. and Atlantic and Piedmont Natural Gas. Co., Inc. (Docket Nos. CP15-554-000, -001; CP15-555-000; and CP15-556-000)

By: Ryan E. Emanuel, Ph.D.

Date: April 6, 2017

1. Introduction

My name is Ryan E. Emanuel, and these are my comments on the draft environmental impacts statement for the Atlantic Coast Pipeline. I hold a Ph.D. in Environmental Sciences, and I am an Associate Professor and University Faculty Scholar in the Department of Forestry and Environmental Resources at North Carolina State University (NC State). NC State is the largest academic institution in the state, and it is one of our two land grant institutions. I lead a research program that focuses on hydrology, ecology, atmospheric science, geoscience and integrated topics, including climate change, socio-ecological systems, and indigenous knowledge. My research program spans North Carolina and extends to other parts of the US and Latin America. I am an enrolled member of the Lumbee Tribe, and I serve the broader American Indian community in various ways, including as an ex officio member of the North Carolina Commission of Indian Affairs' Environmental Justice committee. You can find my curriculum vitae and other information on my website: go.ncsu.edu/water. These comments constitute my professional opinions and do not necessarily reflect the views of NC State, the Lumbee Tribe, or the Commission of Indian Affairs.

My comments principally concern environmental justice, but I also raise issues related to the no-action alternative and attribution of climate change impacts. Of these comments, the environmental justice concerns are most serious; the analysis is fatally flawed and has led to false conclusions regarding disproportionate impacts, particularly concerning American Indians. Section 2 exposes the conceptual and mathematical details of these flaws and discusses the implications. I also provide a basic, but mathematically and conceptually sound analysis of impacts on American Indians, which I offer to regulators as a starting point for new analyses. In it, I reveal that the pipeline stands to impact nearly 30,000 American Indians, representing one quarter of the state's indigenous population and 1% of the US indigenous population. No pending infrastructure project stands to affect as many American Indians as the ACP. In light of these impacts, I explain the importance of tribal consultation. I show that federal and international guidance documents recommend such consultation, even when tribes are not federally recognized.

Section 3 shows that ignoring alternative energy and conservation practices amounts to selective acknowledgement of electricity production as a key purpose of the ACP; electricity production is a widely-touted purpose where it benefits the pipeline, yet it ignored at key junctures in the DEIS. This section also raises systematic issues with absolution of responsibility for climate change impacts during the environmental review process. Ignorance of an effect's magnitude does excuse responsibility, particularly when the direction of the impact (here, a net increase in greenhouse gas emissions) is known. In total, my comments focus on what I believe are at once the weakest but most critical parts of this environmental review. These are the big-picture issues that federal regulators should be best equipped (and most qualified) to handle. Ironically, these seem to be the sections of the DEIS that have received the least attention. There

are no easy fixes to the systemic issues that I raise. Nor should there be; environmental justice and climate change are major challenges of our time. If regulators move forward without acknowledging, remedying, and weighing the implications of (1) fundamental errors in their environmental justice analyses and associated conclusions, (2) selective acknowledgement of electricity production as a valid purpose for some parts of environmental review but not others, or (3) ignoring climate change impacts because the ACP is only one small contributor of greenhouse gases out of many under federal oversight, then they do so with full knowledge that their review is flawed in design and logic, and that present and future generations of poor and minority citizens will suffer because of their oversight. I hope, instead, that regulators choose to revisit these analyses and conclusions, draw additional insight and advice from experts in relevant fields, and produce a clearer, more accurate accounting of the environmental impacts of this project.

2. Environmental Justice Analysis

2.1 Overview

Environmental justice analyses are mandatory in federal Environmental Impact Statements, but there is no standard method for computing disproportionate impacts¹⁻⁴. As such, researchers have raised concerns for many years about potential misapplication of methods or tailoring of methods to support a predetermined outcome^{2,3}. The environmental justice section of the Atlantic Coast Pipeline's draft Environmental Impact Statement (DEIS) appears to be an example of such misapplication. The DEIS concludes there will be no disproportionate impacts on poor or minority communities along the preferred route. However, when the data in Appendix U are analyzed in a statistically appropriate manner, they reveal large disproportionate impacts on American Indians. The failure of the analysis reported in Section 4.9.9 to detect such disproportionate impacts on one particular minority population calls into question its conclusions related to other populations, and it undermines the rigor of environmental justice analysis as a whole.

2.2 Description of Major Flaws

The environmental justice analysis in the DEIS concludes that the preferred route has no disproportionate impacts on minority communities. It draws this conclusion by counting up the number of census tracts with “meaningfully greater” minority populations than the reference populations of the counties in which it they are located. According to the DEIS, this analysis is grounded in guidance from Executive Order 12898 and the EPA; however, this particular approach to analyzing environmental justice impacts has fatal flaws in numerical analysis and overall design that render results un-interpretable and prevent regulators from drawing meaningful (or correct) conclusions about impacts on vulnerable populations.

2.2.1 Mathematically inappropriate comparisons among census tracts

The process of counting census tracts with “meaningfully greater” minority populations fails to account for large differences in population and racial makeup among census tracts and also among counties serving as reference populations. These large differences are described in on p. 4-412 and tabulated in Appendix U¹ of the DEIS. Because the census tracts vary widely in population, one cannot simply compare the number of blocks with “meaningfully greater” minority populations to the number of blocks with smaller minority populations and draw

¹ The DEIS mistakenly refers to Appendix V when referring to results presented in Appendix U.

conclusions about disproportionate impacts. This approach assumes all census tracts carry the same weight in the analysis, but this is not the case in terms of population, area, and many other statistics associated with these census tracts. Such an approach would conclude that a census tract with a population of 1186 predominantly white residents (e.g., WV CT 9601.01) would exactly counterbalance another census tract of 7167 predominantly minority residents (e.g., NC CT 9603). This comparison is mathematically incorrect, and it drastically increases the odds of arriving at false conclusions for the ACP study area, a region where large minority populations in one area can be completely masked out by small, predominantly white populations elsewhere.

Additionally, the process of counting up the number of census tracts with “meaningfully greater” minority populations and comparing this to the total number of census tracts along the proposed route fails to account mathematically for the effects of changing baseline conditions from one county to the next. County-level data certainly provide valuable comparison statistics for census tracts, but when the baseline data change for each county (as is the case here), one loses the ability to draw meaningful mathematical comparisons across county lines. For example, the DEIS states on p. 4-412 for North Carolina, “In 13 of the 42 census tracts, the minority population is meaningfully greater than that of the county in which it is located.” The implied interpretation here is that since the number of census tracts with large minority populations is smaller than the number of census tracts with few minority residents, there must be no disproportionate impact on minorities. However, this interpretation is only valid if the baseline demographics used to compute “meaningfully greater” populations are the same for each county. In this case, the 42 census tracts within North Carolina use eight different reference populations to determine “meaningfully greater.” If the baseline demographic data change from county to county (and they do, based on Appendix Table U1), any attempt to draw conclusions about the proportion of census tracts with large minority populations is invalid outside of a single county. However, this is exactly what the present environmental justice analysis attempts to do. Moreover, as differences in baseline data increase among counties, the risk of under-predicting (or over-predicting) impacts on minority populations increases. Because county-level demographics vary widely over the proposed pipeline route, the environmental justice conclusions of the DEIS cannot be supported by the current analysis in section 4.9.9.

The existing environmental justice analysis hinges on assumptions that census tracts are uniform in population sizes and that reference areas are uniform in demographic characteristics. These assumptions are not stated in the DEIS; rather, the mathematical method chosen for this analysis demands that these assumptions be met. In fact, these assumptions are simply untrue, and this has led to invalid comparisons of census tracts in the environmental justice section of the DEIS. At face value, it may seem that census tracts are similar units that can be compared side by side. However, the census tract statistics that have been chosen for comparison cannot be tallied up, because they ignore both the weighting effects of actual population sizes and the mathematical constraints of shifting baselines.

The design of the existing analysis, which involves simply comparing the number of census tracts above or below a threshold, fails to provide a means to evaluate statistical significance of the results. A statistically robust analysis would, minimally, involve pooling all of the impacted census tracts for each state, and comparing this test population with a suitable reference population drawn from each state. This method would allow regulators to (1) compute disproportionality rates from the demographic profiles of test and reference populations and (2) determine whether these rates are statistically significant using tests such as the Wilcoxon Rank-

Sum test or the T-test. This method can be conducted for minority population as a whole and for specific racial or ethnic categories.

2.2.2 Ambiguous definition of “meaningfully greater”

The method for determining “meaningfully greater” poses mathematical problems for comparing census tracts. Footnote 20 (p. 4-412) defines “meaningfully greater” as ten percentage points higher than the comparison group. By defining differences in terms of percentage points, the analysis masks relevant information in areas where minority (or poor) populations are either very small or very large. At the small end of the scale, a reference population that comprises, say, 2% minority individuals would require that the test population be at least 12% minority in order to identify a disproportionate impact. In this example, the proportion of minority residents of a census tract would have to be six times greater than the reference proportion before the tract registers as “meaningfully greater.” This places an unusually high (6x) detection threshold on the census tract, and it increases the risk of overlooking a disproportionate impact in predominantly white areas of a study region.

At the other end of the spectrum, regions with predominantly minority (or poor) populations include census tracts that are already surrounded by large minority (or poor) populations. If a reference population is already, say, 65% minority, then the present analysis requires a census tract to have a minority population of 75% before it is classified as disproportionately impacted. Here, the analysis forces a strange proposition – census tracts with some of the highest minority populations along the entire route are excluded from the “meaningfully greater” category in the broader analysis simply because they are situated in a majority-minority county. Indeed, Table U1 reveals census tracts in North Carolina with minority populations in excess of 75% that do not count towards the disproportionate impacts of the project as whole because they are situated a county with a disproportionately large minority population (70%) compared to the rest of the study area. This example highlights a key problem with the present environmental justice analysis. Whether the analysis uses a fixed percentage point exceedance or some other metric, correct identification of a reference population is crucial for determining the scale at which the analysis may be interpreted.

In the case of the ACP, use of county-level reference populations in the “meaningfully greater” computation means that counties cannot be compared directly with one another. More specifically, the definition of “meaningfully greater” must be further defined as “meaningfully greater than the county in which the census tract is located.” Given this mathematically constrained definition, the present analysis is incapable of determining disproportionalities for the project as a whole; it simply answers a series of county-by-county questions about disproportionate impacts on minority populations. One purpose of federal oversight on projects of this scale is to ensure that the project as a whole does not place disproportionate impacts on vulnerable populations. This purpose simply cannot be achieved by the present analysis.

2.3 Implications of Flaws

The inability of the environmental justice analysis to evaluate disproportionate impacts for the project as a whole raises serious concerns about its utility. Given that a key purpose of an environmental justice analysis is to reveal the extent to which poor and minority populations may bear a disproportionate share of a project’s environmental cost, an analysis that concludes no impacts for a project traversing large regions with substantial minority populations (e.g., Halifax, Northampton, Robeson Counties, NC) and poor populations (e.g., Brunswick, Buckingham

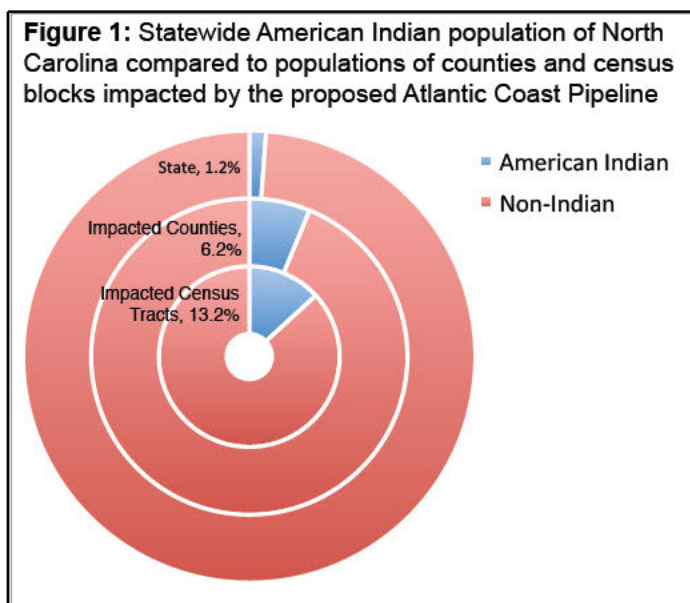
Counties, VA) while skirting adjacent whiter, wealthier areas (e.g., Albemarle, VA; Wake, NC) should raise serious concerns among regulators. In the case of the ACP, this is not a hypothetical scenario. Not only does the project cross areas of high poverty in rural Appalachia, but it also runs through the so-called “Black Belt”⁵ of Virginia and North Carolina. Both regions have borne disproportionate shares of environmental burdens throughout US history, and their local populations live with an unfortunate legacy of past environmental decision making in which they have had little or no part. These are, quite literally, the textbook study regions for environmental justice. Federal regulators should be first to acknowledge these large-scale, multi-state patterns of inequity and to hold petitioners accountable for their activities in these regions. Instead, the environmental justice conclusions of this DEIS hinge on what is essentially a series of county-level calculations, combined in a mathematically indefensible fashion, and hard-wired to ignore important regional demographic patterns that frame the project as a whole.

2.4 Realistic Environmental Justice Analysis

In the previous sections, I offered technical suggestions for remediating the flawed design of the current environmental justice analysis. Here I provide an example of a more realistic environmental justice analysis that pools census tract data in a statistically appropriate manner. This example analysis could be expanded and applied to other demographics throughout the study area as a whole. Data from Appendix U show that in North Carolina alone, approximately 30,000 American Indians live in census tracts along the route. To place this number in a larger demographic context, it represents one quarter of the state’s American Indian population and 1% of the entire American Indian population of the US. To put this in qualitative terms, there is no other energy project currently under federal review that stands to impacts as many American Indians as the ACP.

When populations are summed for census tracts along the North Carolina portion of the pipeline route, I find that 13.2% of the total population of these census tracts identifies as American Indian. For the North Carolina counties in which these census tracts are located, American Indians constitute 6.2% of the population. American Indians constitute 1.2% of the entire population of the state of North Carolina. Figure 1 compares aggregate census tract, county, and state-level statistics.

Using either the county-level data or the state-level data as a baseline, we find that the proposed route impacts American Indian populations at disproportionate rates. Within the affected counties, the proposed route is 2.1 times as likely to impact American Indians as expected based on the appropriate reference population. In this case, the appropriate reference is the total population of the selected counties. Within the state of North Carolina, the proposed route is 11 times as likely to impact American Indians as expected based on the appropriate reference



population. Here, the appropriate reference is the state-level population.

When data from Table U are properly aggregated, and when appropriate reference populations are selected, we find that the proposed route undoubtedly imposes disproportionate impacts on American Indians. By comparing the state-level, county-level, and tract-level results further, we can begin to understand the underlying reasons. Specifically, comparing state-level data to the impacted counties reveals the large-scale route of the pipeline through North Carolina's "Black Belt," where many of the state's American Indians have maintained continuous settlements for centuries. The Meherrin, Haliwa-Saponi, Coharie, and Lumbee tribes in particular claim ancestral territories in North Carolina's Coastal Plainⁱⁱ, and the proposed pipeline route passes, preferentially, through their ancestral territories relative to other regions of the state. Hence, it is no surprise that a pipeline through this region of the state would impact American Indians disproportionately.

At a finer scale, the data show that the pipeline would still impact American Indians disproportionately, even in a region of the state where their populations are already high relative to the state as a whole. Many of these census tracts surround the historic Lumbee community of Prospect. This community is situated within a larger cultural landscape of historical and spiritual importance to many Lumbee people. This community is also the southern terminus of the proposed pipeline. Why the developers would plan to route the project through this community or locate its terminus here is unknown. Nevertheless, the choice to route the pipeline through this culturally significant landscape and through other areas of significance to other tribes explains, in part, why American Indians, who continue to live in and around these culturally significant landscapes, are impacted disproportionately by this project. In providing this analysis, I hope to demonstrate to regulators how an appropriate choice of reference population, combined with culturally relevant knowledge about the pipeline route can provide a more accurate view of environmental justice concerns related to American Indians.

2.5 Tribal Consultation and Environmental Justice

Given the disproportionate impacts on American Indians revealed in the previous section, I recommend that the regulatory agency engage in formal consultations with governments of the Meherrin, Haliwa-Saponi, Coharie, and Lumbee Tribes in North Carolina and with tribal governments in Virginia as wellⁱⁱⁱ. The four tribes listed above are recognized by the state of North Carolina, and the pipeline crosses each tribe's ancestral territory. Tribes have lived in these areas for many centuries, and they maintain unique cultural and religious attachments to specific lands and waters of their ancestral homelands. Given relatively weak relationships between North Carolina tribes and the state's Historic Preservation Office, and given lack of resources available to tribal governments, little information is publicly available about cultural or religious sites of importance to these tribes. Thus, regulators should be proactive in approaching these tribes to learn, firsthand, about their needs and priorities.

ⁱⁱ The Waccamaw Siouan tribe also inhabits the Coastal Plain, but the proposed route does not appear to pass through their territory. It would be safest to contact them as well as all Virginia tribes.

ⁱⁱⁱ The list of tribes is not exhaustive. North Carolina recognizes four additional tribes, and it is possible that members of these tribes or members of other federal or non-federal tribes may be among those impacted. Several tribes are currently based in Virginia as well.

Regulators are not compelled by law to enter into high-level consultations with state recognized (i.e., non-federal) tribes, but NEPA and NHPA guidance documents^{iv} advise regulators to engage non-federal tribes in formal consultation in light of the unique, place-based relationships that indigenous peoples hold with their traditional landscapes and natural resources. In the case of the ACP, regulators have already set a precedent for offering consultation status to entities other than federally recognized tribes when they granted consultation status to the Nelson County (VA) Board of Supervisors under Section 106 of the NHPA. If a non-indigenous group can receive consultation status under a federal law that protects cultural landscapes, surely indigenous tribes, regardless of their federal status, can receive similar consideration.

In addition to federal law, the United Nations Declaration on the Rights of Indigenous Peoples affirms the right of all indigenous peoples to give “free, prior, and informed consent” to governments before they undertake activities that affect indigenous lands and life ways. The Declaration provides additional guidance on the nature of consultation with indigenous peoples, and the US has endorsed the Declaration since 2010. Earlier this year, a UN Special Rapporteur on the rights of indigenous peoples visited the US to document issues surrounding energy development, tribes, and consultation. Her initial report^v highlights deficiencies in federal policy surrounding tribal consultation and points to larger structural problem in federal-tribal relations. In particular, the rapporteur notes:

“The goal of tribal consultation is not simply to check a box, or to merely give tribes a chance to be heard. Rather, the core objective is to provide federal decision makers with context, information, and perspectives needed to support informed decisions that actually protect tribal interests.”

I urge regulators to take the rapporteur’s advice seriously and engage in meaningful consultation that surpasses form letters or emails. Even a basic environmental justice analysis that handles data appropriately (e.g. Section 2.4 above) reveals disproportionate impacts of the ACP on indigenous peoples. The impacted tribes of North Carolina and Virginia, regardless of their federal recognition status, deserve appropriate high-level consultation with regulators given the fact that their ancestors once owned most of the region under discussion. Through a long history of war, dishonest dealings, disenfranchisement, segregation, and environmental racism, their land holdings were diminished and degraded to the small fractions that remain today. Yet their spirits and voices have not been so diminished. Engage in meaningful discussion to learn about the cultural landscapes, sensitive ecosystems, and historical contexts that underlie tribal interests and concerns related to this project. Recognize the vast asymmetry that exists between federal resources and tribal resources in areas of finance, personnel, and information. Send FERC tribal liaison, Elizabeth Molloy to meet with individual tribal governments and with the North Carolina Commission of Indian Affairs – the state-authorized body dealing with issues of concern to all American Indian tribes within North Carolina.

^{iv} Advisory Council on Historic Preservation, *Consultation with Indian Tribes in the Section 106 Review Process: A Handbook*, June 2012; National Environmental Justice Advisory Council, *Guide on Consultation and Collaboration with Indian tribal governments and the public participation of indigenous groups and tribal members in environmental decision making*, November 2000.

^v End of Mission Statement by the United Nations Special Rapporteur on the rights of indigenous peoples, Victoria Tauli-Corpuz of her visit to the United States of America, March 2017.

Engagement and consultation between regulators and tribes should take place in a way that is fundamentally different from outreach efforts that have occurred to date. Here I refer to efforts led primarily by pipeline developers. Their in-person efforts to engage tribal communities through open houses and other presentations might best be classified as marketing activities. Far from high-level discussions with tribal leaders and elders, activities occurring since 2014 in and around tribal communities could be described as marketing efforts by pipeline developers aimed at emphasizing potential advantages of the project while downplaying risks. One key objective of these efforts appears to be the collection and dissemination of endorsements from communities along the pipeline. The ever-growing body of online advertisements leveraging endorsements from individuals, local governments, and other groups suggests that pipeline developers treat community interactions as opportunities to fuel public relations and advertising campaigns. A list of endorsers on Dominion's website^{vi} points to this mindset as well. Interestingly, as of April 6, 2017, the website still lists the Haliwa-Saponi Tribe of North Carolina among "ACP Supporters" even though the tribe formally revoked its support months ago after learning about pipeline impacts not revealed by corporate representatives during outreach activities.

Developers have every right to pursue outreach and public relations activities that portray their projects favorably, but these activities are not consultation as defined by the Advisory Council on Historic Preservation, the National Environmental Justice Advisory Council or the United Nations. Dissemination of information and material in tribal communities that deliberately highlights advantages and downplays risks of a project while simultaneously seeking to leverage public endorsements for future advertising cannot be construed as consultation by any definition. These activities, together with developers' strategic gift giving in communities along the pipeline route, could be described more accurately as asymmetric power plays by corporations that made decisions long ago without input from vulnerable communities. Now these corporations seek to check the proverbial box of consultation in the exact manner that UN Special Rapporteur Tauli-Corpuz warned against. Such one-sided corporate engagement efforts together with untenable analytics have now placed pipeline developers and regulators in a difficult position to defend: On one hand the DEIS claims no disproportionate impacts on minority communities, but on the other hand the project would impact a substantial fraction of the largest indigenous population of the eastern United States.

The stark disconnect between the environmental justice analysis and reality not only reflects major flaws in the present study, but it also bears resemblance to some of the factors underlying indigenous resistance to the Dakota Access Pipeline (DAPL). In that case, Energy Transfer Partners pursued public relations-oriented outreach with the Standing Rock Sioux Tribe, but the proposed route was strongly criticized by tribal leaders in 2014. Federal regulators (here, USACE) missed important opportunities to understand and weigh tribal priorities and concerns pertaining to NHPA Section 106 and other regulations. Had meaningful consultation occurred, ideally during the route-planning portion of the project, changes could have been made to address tribal concerns. Mass demonstrations, protests, and public outcry against DAPL may not have occurred. In this respect, DAPL serves as a cautionary tale to developers and regulators who may view consultation as an obstacle to overcome rather than an opportunity to learn more about the communities being asked to shoulder the cultural and environmental burdens of such projects.

There are important distinctions between DAPL and ACP related to indigenous peoples, including the fact that most indigenous peoples along the ACP route belong to non-federal tribes

^{vi} <https://www.dom.com/about-us/news-center/natural-gas-projects-and-initiatives/atlantic-coast-pipeline>

and are not entitled to consultation by law. However, federal agency guidance and federally endorsed international guidance (Footnotes iv and v) advise consultation with indigenous peoples regardless of recognition status. The social, political, and historical reasons explaining why tribes lack federal recognition are many and complex, but tribes' claims to their ancestral territories are demonstrable and significant. Given that the indigenous population along the ACP is more than double the combined population of the Standing Rock Sioux Tribe and Cheyenne River Sioux Tribe (the two tribes leading legal opposition to the DAPL), a prudent approach for ACP developers and regulators would involve immediate and meaningful consultation with governments of all tribes whose citizens stand to be affected by this project.

3. Alternative Energy and Climate Change

Alternative energy sources are not considered in the no-action alternative (Section 5.1.15) because regulators claim that generation of electricity is beyond the scope of the proposed project. Specifically, the DEIS states that “the purpose of ACP and SHP is to transport natural gas” (p. ES-13, 5-26). However, this statement does not accurately reflect the primary purpose of the project, as defined by the petitioner. According to Section 1.1, the primary purpose for the project is electricity generation (p. 1-2). Indeed, most of the gas (79%) is intended for electricity generation. That the petitioner adds “by using the natural gas to generate electricity” to its purpose statement does not negate the fact that the principal motivation for this project is electricity generation. The DEIS contains numerous discussions that emphasize the project's intended purpose of generating electricity. The DEIS highlights the growing need for electricity in the region (p. ES-2), the economic advantages of gas-derived electricity (p. 3-3, 4-408), the greenhouse gas advantages of gas-derived electricity over coal (4-512), and improvements to regional air quality as electricity production shifts from coal to gas (ES-13). The principle petitioners, Duke Energy and Dominion Power, are mainly in the business of producing electricity. According to Duke Energy's most recent annual investor report^{vii}, the company's electricity entities – Duke Energy Carolinas and Duke Energy Progress – will be the pipeline's principle customers.

A reasonable reading of the DEIS alone or in combination with corporate materials reveals that electricity generation is, unquestionably, the overarching motivation for this project and the principle counterbalance for all of the environmental and socioeconomic impacts identified during the review. With this in mind, to claim that conservation and alternative energy cannot be considered in the environmental review because the purpose of the project “is to transport natural gas” is, at best, disingenuous. If the scope of this environmental review is limited to transporting natural gas, then all of the aforementioned benefits of gas-derived electricity should be struck from the DEIS. If these benefits remain in the review, then regulators implicitly acknowledge that the purpose of the project is to generate electricity, and they are obliged to carefully consider both alternative energy and conservation measures throughout the review. Either acknowledge electricity generation consistently in the DEIS, or ignore it altogether. Selective ignorance is indefensible.

Including alternative energy in the environmental review is important given North Carolina's emerging role as a national leader in solar and wind energy. Utility-scale and smaller initiatives are underway across the state, and a major influx of new natural gas supplies has the potential to serve as a double-edged sword. On one hand, as developers will correctly argue,

^{vii} https://www.duke-energy.com/_/media/pdfs/our-company/investors/de-annual-reports/2016/2016annualreport.pdf

natural gas may serve as a steady-load complement to less predictable inputs of wind and solar projects. On the other hand, new pipeline infrastructure will lock the region into decades of continued dependence on an unsustainable and, ultimately, dangerous source of energy in terms of its climate change potential.

The best available science suggests that greenhouse gas emissions need to be curtailed significantly and immediately. Replacing coal with natural gas may result in a relative decrease in greenhouse gas emissions, but when fugitive methane emissions are considered together with the added combustion capacity described in the DEIS, the ACP still results in a net increase in greenhouse gas emissions over 2017 and moves us toward the worst-case scenario of climate change^{viii}. The DEIS acknowledges that greenhouse gas emissions associated with the ACP will contribute incrementally to climate change, but it fails to assign the project any responsibility for those incremental changes (p. 4-511). Although we may not be able to determine the magnitude of climate change assignable to the ACP, we know the sign of its impacts. In other words, the ACP will unquestionably sustain the release of carbon dioxide and methane into the atmosphere over the project's lifetime. Inability to quantify the degree of change attributable to a particular project does not absolve the project from any responsibility whatsoever, particularly when the direction of change is unquestionable.

Federal regulators are fully aware of the greenhouse gas implications of natural gas development, including the development of shale gas from central Appalachia^{6,7}, and I will not provide a detailed review of those implications here. Instead, I point out that ignoring all climate change implications simply because we cannot assess the degree of contribution is unsustainable and irresponsible policy. If each fossil fuel infrastructure project is reviewed by this standard, then the federal agency responsible for reviewing and authorizing such projects will never have an opportunity to weigh in on the most serious, cumulative impact of the totality of such projects.

4. Conclusions and Recommendations

The DEIS contains a thorough review of many topics of environmental concern to stakeholders along the pipeline route. However, the review process, in its current form, has failed to ensure that its environmental justice obligations have been met. A poor environmental justice analysis failed to detect important demographic patterns that manifest as disproportionate impacts on poor and minority communities (particularly American Indian communities) at multiple spatial scales. In terms of consultation with American Indian tribes, regulators and petitioners have been demonstrably active, but the activities described in the DEIS are strongly geared toward public relations and marketing by petitioners and should not be misconstrued as consultation. Although regulators are not bound by law to consult with most of these tribes because of their non-federal status, federal and international guidance documents recommend doing so.

The broader question of whether the review of this project has satisfied its environmental justice obligations demands that American Indian tribes and other vulnerable communities along the pipeline route have a seat at the decision making table. A seat at the table means that these

^{viii} Globally, we are tracking the RCP8.5 emissions scenario from the latest round of general circulation model projections. The scenario shows that human greenhouse gas emissions will drive warming globally, and this will manifest as climate change (e.g., warmer summers in the Southeast, declining snowpacks in the American West, more extreme weather globally, etc.) RCP8.5 is commonly referred to as the "worst case scenario" and is generally accepted by scientists and most of the world's decision makers as an unsustainable trajectory.

communities' perspectives matter, not only on the back end (i.e., after the route has been determined) but on the front end as well. Whether regulators acknowledge it or not, these communities are the least equipped to deal with either guaranteed or probably impacts of climate change. Along the ACP, these impacts include, most notably, a significant increase in summer peak-load electricity usage due to increasing summer temperatures⁸.

To remedy issues raised with the DEIS, I recommend that regulators first create a new environmental justice analysis, ideally in partnership with federal staff or academic researchers who are familiar with common challenges of such analyses. The National Environmental Justice Advisory Council would be a logical place to begin the search for a partner. Once the new analysis has been performed, I encourage regulators to grapple with tough questions that will likely arise due to disproportionate impacts on poor and minority populations along the route, particularly in North Carolina. While it is true that the petitioners have already worked for years to secure easements along the proposed route, their ignorance of environmental justice obligations or reliance on flawed methodologies does not excuse the requirement to perform the analysis correctly and take the results seriously.

Furthermore, I recommend that the FERC immediately set up in-person meetings between its tribal liaison and governing bodies of impacted tribes along the proposed route. This issue is too important to relegate to emails or form letters (ask the USACE or the Standing Rock Sioux Tribe). During meetings, the liaison should inquire about prior interaction between tribes and petitioners, including open houses, informational meetings, and gift giving activities in and around indigenous communities. This information will provide valuable context and help regulators understand the status of relationships and interactions between tribes and petitioners. In addition to meeting with tribes, I recommend the liaison attend an upcoming quarterly meeting the North Carolina Commission of Indian Affairs. This body informs and advises the state government on all issues of concern to tribes, including issues related to environment, economic development, and public health.

I also advise regulators to correct the logical inconsistency in the DEIS dealing with the selective failure to consider electricity production as the main purpose of the ACP. The petitioners themselves promote this purpose, and DEIS states that this is the purpose in many instances where it promotes a benefit or offsets an impact. Please also reconsider the failure to weigh climate change impacts simply because the magnitude of impact cannot be determined. This is shortsighted policy and logically inconsistent. If this practice continues in environmental reviews, global society will pay a heavy toll due to our unwillingness to count the cost of our continued reliance on fossil fuels.

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